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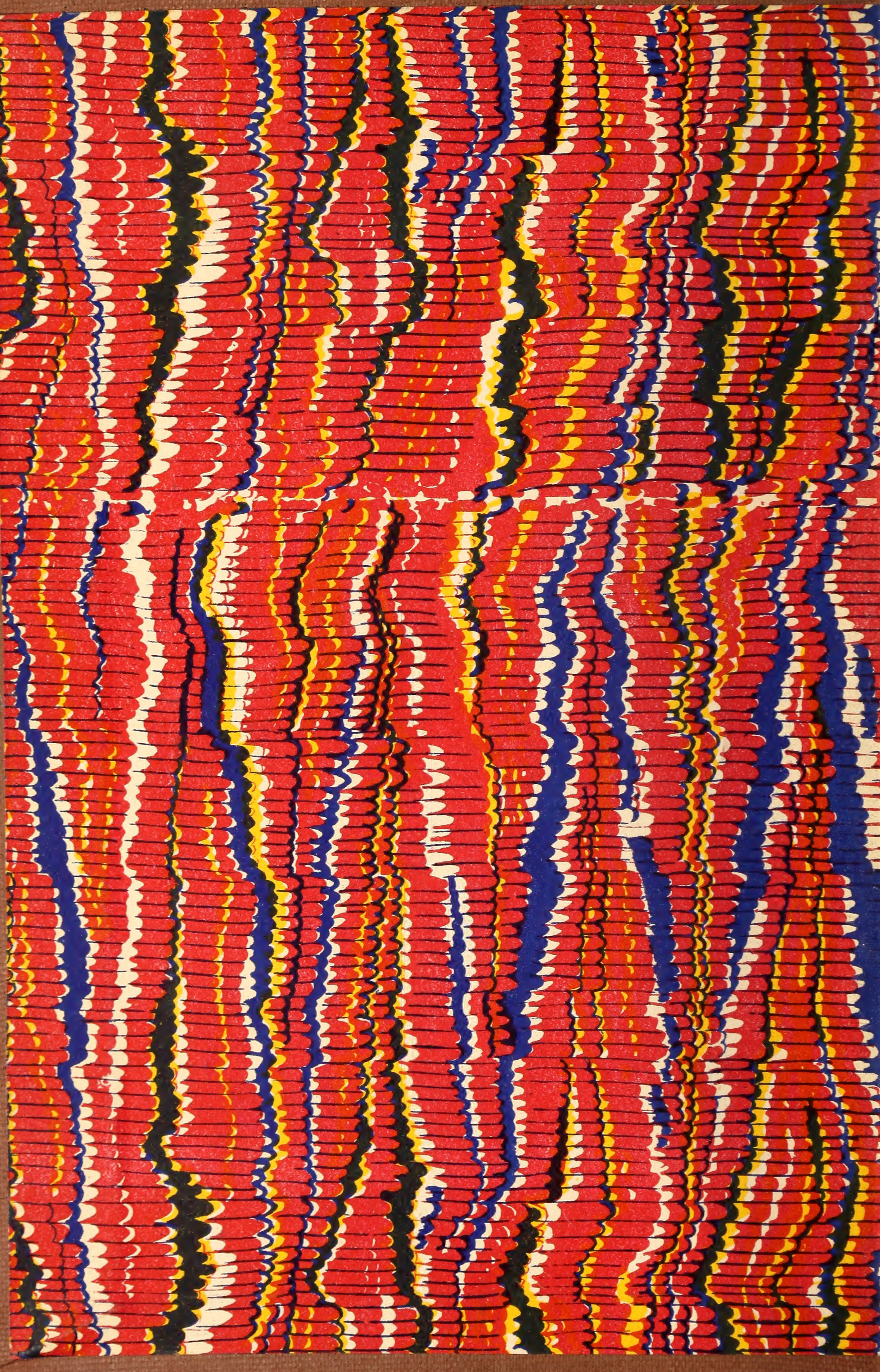

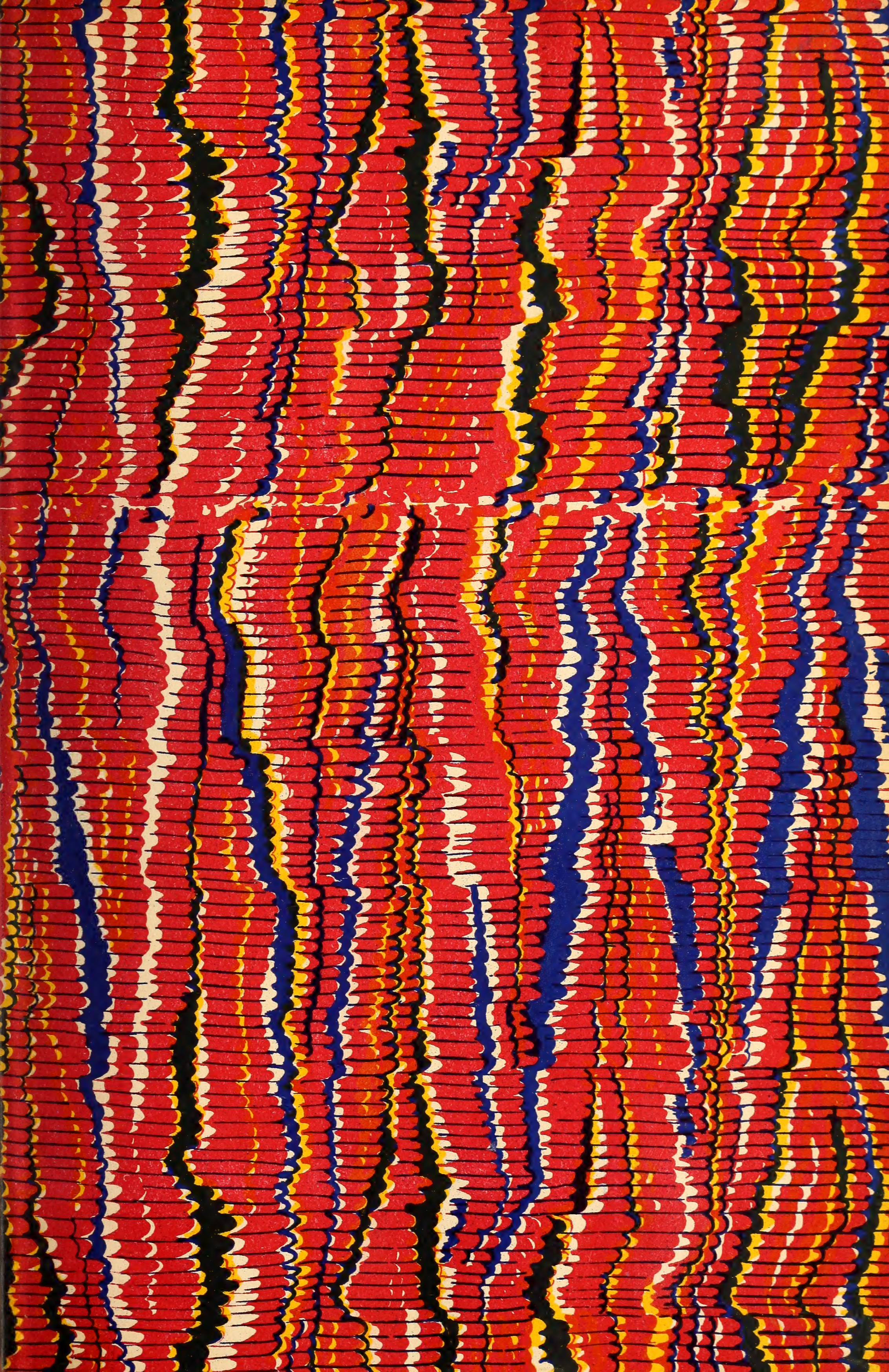

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THE AMERICAN BOTANIST

A QUARTERLY JOURNAL OF ECONOMIC AND
ECOLOGICAL BOTANY

EDITED BY WILLARD N. CLUTE

Volume XIX

SMITHSONIAN INSTITUTION
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U. S. NATIONAL MUSEUM.

JOLIET, ILL.
WILLARD N. CLUTE & CO.
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THE AMERICAN BOTANIST

FEBRUARY, 1913

25 Cents a Copy; $1.00 a Year

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WILLARD N. CLUTE & CO.
JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.00 a year or $1.50 for two years, payable strictly in advance. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

BACK NUMBERS.—Volumes 1 to 10 inclusive consists of 6 numbers each, Vols. 11 to 13 of 5 numbers each and all later volumes of 4 numbers each. The first 18 volumes may be had for 75 cents a volume, or the set will be sent for $9.00. A full set contains 2312 pages.

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California Fan Pàlms *(Washingtonia filifera var. robusta)* in Palm Canyon.

THE AMERICAN BOTANIST

VOL. XIX JOLIET, ILL., FEBRUARY, 1913 No. 1

One month is past, another is begun,
Since merry bells rang out the dying year,
And buds of rarest green begin to peer
As if impatient for a warmer sun;
And though the distant hills are bleak and dun,
The virgin snowdrop, like a lambent fire,
Pierces the cold earth with its green-streaked spire.

—Hartley Coleridge

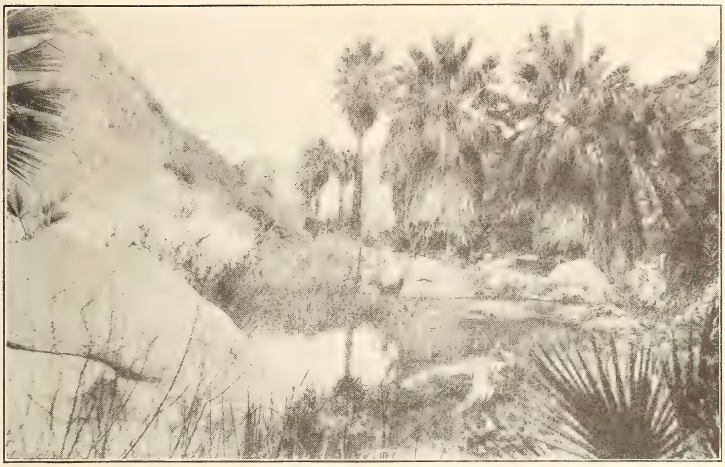
IN THE HOME OF THE FAN PALM

BY CHARLES FRANCIS SAUNDERS.

THE canyons of the eastern side of the San Jacinto Mountain, opening on the desert, hold a special interest for the traveler as being the native habitat of the California fan palm, which in cultivation forms such a conspicuous feature of the streets and lawns of Southern California, as well as some parts of Europe—a tree of dignified beauty, upon which science has bestowed the name of *Washingtonia* in honor of the great first President. Of all these canyons Palm Canyon is the one that best repays a visit, both because of the beauty and luxuriance of the groves there, because of its accessibility—its mouth is thirteen miles from Palm Springs station on the Southern Pacific Railroad—and because of the accommodations it offers the camper; for camp the visitor must, the region being wilderness pure and simple. Palm Canyon, as well as some of the others, is now a portion of the Cleveland National Forest Reserve, and the interest felt by the local forester in maintaining and increasing the unique woodland, was evidenced at the time of our visit by this terse notice penciled on a post of the wire fence that extended across the canyon's mouth: "Close the gate. I don't want cattle to get in the young palms."

The first impression that forces itself upon the visitor to this canyon is that wherever he is, he is certainly not in the United States, so effectually do these wild palms give the stamp of strangeness and remoteness to the scenery. The lower slopes of San Jacinto's desert side are as barren as the desert itself—devoid of vegetation save a sparse growth of xerophytic plants that live with slight regard to moisture. The canyon sides, therefore, instead of being clad with clinging trees and verdant shrubs, as one naturally expects in a canyon, are austere uplifts of scattered, sun-burnt rock whose expanses are unrelieved save here and there by a bulky cactus or a clump of those unhonored plants that desert dwellers lump together indiscriminately as sagebrush and greasewood.

From the vantage ground of these treeless sides, one sees, far down in the bed of the gorge where the stream ripples along, the winding procession of the stately palms issuing by hundreds from the fastnesses of the mountain's rifted sides, gathering numbers as the canyon widens, and disappearing finally in the pitiless maw of the all consuming desert. In the sunlight their rounded crowns, lifted on slender bare trunks to the height of 80 or 90 feet above the ground, glisten and nod like the plumed helmets of an army of ancient days. Don Quixote would surely have taken them for some giant host bound under a magic spell. Indeed one soon begins to wonder if an enchantment is not upon the whole place—so unlike the customary American sort of scene is it, so shut out from the world of today, so palpable is the silence, so unreal that pulsating distance, where, beyond the canyon's mouth, the dim



These trees have never beeen fired. Note the thatch of dead leaves.

mountains of the desert stretch bands of unnamable, shifting colors above the hot, white sands. So still is it that the flight of a silent bird near by startles us, and our day dream broken, we clamber down to the bed of the spring.

The stout of limb may wander indefinitely beneath the shadow of these palms, following the tortuous course of the stream deep into the secret places of the mighty mountain. Gray, water-beaten bowlders strew its bed and margins, their surfaces pounded into smooth pockets and worn into many a fantastic shape by the aqueous action of ages. With the memory of the desert fresh upon us, it seems a heavenly place by these crystal waters, now dropping in musical cascades, now gathered in still pools reflecting their sedgy fringes; now flowing in open sunlight, now lost in quivering beds of cattails and rushes and groundsel thickets. Wild flowers of brilliant hue brighten the tiny, sandy beaches that form here and there in the shelter of great rocks—flowers of compelling charm but so unknown to men that they are nameless except in the harsh lexicon of science. For nearly two miles up the canyon's bed the palms continue, sometimes standing scattered or in single file, sometimes massed in considerable groves, little families of thrifty seedlings clustered near them and reaching up to the light and air through the matted debris and driftwood that cradled them. Now and then a side gorge opens into the main one, and looking along its rugged bed we see more palms descending.

The natural habit of the *Washingtonia* is not to shed its old leaves, but to let them hang, fan downward, in the form of a brown thatch protecting the bole from the fierce heat of the desert summer. Normally, therefore, the tree's trunk is clothed in dead leaves from the base, or nearly so, to the living crown of green, and this is always the case with the younger trees. It is a curious fact, however, that the trunks of the old trees are invariably bare except for a short cluster of brown foliage immediately beneath the green top, and the trunks themselves are more or less charred and blackened. It appears that this is the result of the firing of the trees by Indians, and thereby hangs two tales.

In the days before the advent of the whites, the red men of the desert set great store by the palm as the source of food supply. The fruit is a small, black, stony berry about the size of a pea, borne in loose, pendant clusters not unlike bunches of chicken grapes in appearance—and the Indians used regularly to gather these berries, preparing a food from them by grinding. It is maintained by some that the burning of the dead leaves as they hung upon the trunks, was with the idea that the fruitfulness of the trees was thereby increased, just as blueberry patches in New England are often burned over by white folk to improve that crop. There is, however, another explanation of the charred palms. Under the old order of aboriginal life, each grove was considered the property of some one clan of the tribe; and whenever a member of that clan died, fire was set to one of its trees. As the flames mounted upward, fed by the accumulation of dead leaves, the spirit of the tree was believed to be released, and taking its place by the departed spirit of the man, became his servant in death as its outward form had been his servant in life. So its grateful shade moved with him and protected him from the sun on his journey across the treeless sands to his long home. This latter explanation is discredited by the "practical man," but the folk-lorist and the poet do not find it inconsistent with the Indian's habit of thought.

Pasadena, Cal.

THE CULTIVATION OF THE IRIS

By Willard N. Clute.

IN classical mythology, Iris was the goddess of the rainbow and to moderns the name is still suggestive of deep and brilliant color. It was therefore most appropriate that the plants we commonly know as "flags" should be given the name of iris for a generic title. All the tints of the rainbow, in fact, with the possible exception of deep red, are to be found in the flowers of different species, though the blossoms of the group, as a whole, incline to the lovely blues, violets and lavenders that are usually rare in any collection of flowers. Orchids may, indeed, outrival them in bizarre forms and color patterns, but in matters of pure color alone, the irises are probably superior. To call them "the poor man's orchids," as is sometimes done, is to "Damn them with faint praise."

For centuries flower lovers were content to cultivate grandmother's purple and white flag lilies without thought of trying to improve them or of introducing more desirable plants though here and there an occasional new form crèpt into cultivation, but now that plant collectors and nurserymen have begun to ransack the earth for the more beautiful species it is not surprising to know that the cultivation of irises is fast growing in popularity.

There are rather more than a hundred different species of iris in the world besides a large number of varities and hybrids produced by cultivation. The family to which our plants belong is noted for the production of beautiful flowers and includes the gladiolus, crocus, freesia, ixia and many others. The little blue-eyed grass of damp meadows is a sort of poor relation of the more regal members. The family (Iridaceae) is especially well represented in South Africa, but the irises are all plants of the northern hemisphere though a few extend their range to the countries south of the Mediterranean. The dry region extending from Asia Minor to Persia seems to be the headquarters of the genus, just as South Africa is for the gladiolus, but irises are also found in Japan, Siberia and throughout Europe and North America.

The tall growth of the Siberian Iris is characteristic.

(Courtesy of Meehans' Garden Bulletin.)

Iris pallida Dalmatica is one of the finest of all. Its very large flowers are delightfully fragrant.

(Courtesy of Meehans' Garden Bulletin.)

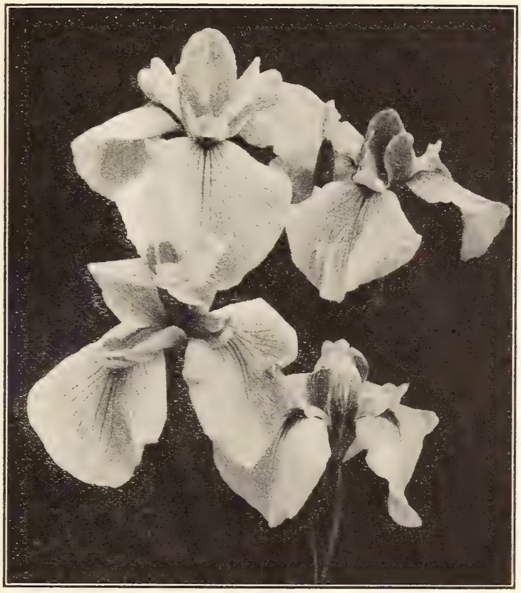
In size, irises range from the little *Iris cristata* of our southern pine barrens which is less than six inches high when full grown, to the great *Iris Orientalis* of Syria which attains a height of as many feet. A large number of the species are evergreen, or nearly so, and give a tinge of green to the garden even in winter. *Iris foetidissima* is especially noted in this connection and has, in addition, the distinction of being the only species in the genus with bright red seed pods. *Iris fulva*, or *Iris cuprea* of the older books, has copper red flowers, the mourning iris *(Iris susiana)* has flowers heavily veined with deep brown and black while several closely related species have flowers equally curious in markings. *Iris pseudacorus,* a European plant naturalized in many moist places in America, has golden yellow flowers, those of the Florentine iris *(Iris Florentina)* are milk white, while those of the snake's head iris *(Iris tuberosa)* are green and black. *Iris sambucina* has flowers with the scent of elder blossoms. The snake's head iris is medicinal, while from the Florentine iris comes the familiar orris root, the word orris evidently being a corruption of iris.

Since the irises are practically all plants of the North Temperate Zone, they are likely to prove perfectly hardy in the United States. There is a prevalent impression that irises are difficult to grow in ordinary gardens, but this is a mistake, due, probably to the fact that our best known native species, the blue flag *(Iris versicolor),* is found in low grounds. On the contrary, nearly all irises thrive in any good soil and delight in sunny situations. The blue flag itself, is especially vigorous in such surroundings. As a matter of fact, the irises, like their relatives the crocus and gladiolus, are dry ground, almost desert, plants. A Japanese species *(Iris tectorum)* grows on the thatched roofs in its native land, and even those species that grow naturally in water have many of the features of drouth plants, such as underground storage organs, and narrow leaves covered with wax or "bloom" and turned edgewise to the sun. Even the internal structure of the leaf and stem is similar to plants of dry regions. Though the situations in which many species grow may be wet in spring, they are often exceedingly dry in midsummer. The average garden is thus seen to present conditions quite suitable to irises and our hot dry summers have no serious effects upon them; in fact, many species become quite dormant at this season and the temperature makes no difference to them.

The way to succeed with most irises is to plant them in good garden soil in a sunny situation and then let them alone. During the growing season they need as much water as other plants, but not more. They may be given a light mulch in winter though most species appear to get along all right without this. One section of the family, however, requires more care. This is the so-called Oncocyclus or cushion iris section whose members came originally from a region so hot and dry that they die down to the ground after flowering. With us, instead of having to be given water, they actually have to be protected from it for part of the year, either by means of hot-bed sashes placed over them or by being dug up and placed under shelter; otherwise they would start into growth at the wrong time. These plants require considerable lime in the soil to do well; in fact nearly all irises are fond of lime. The Japanese iris *(Iris laevigata)* is one of the few that are supposed to dislike lime, and its cultivation is not always attended with success, but it is one of the handsomest of the family and its beauty makes it worth much care.

Not only do the irises thrive in gardens, but those most often cultivated are so well suited to such conditions that they multiply very rapidly. They really ought to be dug up every three or four years and thinned out. All the irises grow from underground stems which are either rhizomes or corms. The rhizomes are thickened root-like parts extending horizontally at or just beneath the surface of the earth from which the real roots grow. The corms, usually miscalled bulbs, are erect and somewhat deeper in the soil. The species with rhizomes multiply most rapidly. The main axis branches again and again and each branch with its quota of roots will form a new plant. If one wishes to multiply his specimens he has only to tear the plants to pieces and replant the separate parts.

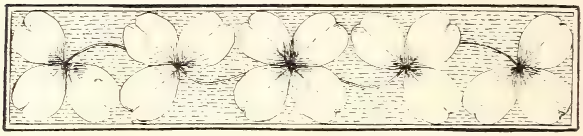
Although there are a great many species of iris in cultivation, it is not easy to get a very extensive collection together for the reason that the nurserymen carry only a few standard sorts, and even these are not always correctly named. One may flatter himself that he is accumulating a creditable array of species, only to find later that most of his plants, handsome though they be, are varities of the common German iris *(Iris Germanica)*, or hybrids between it and allied plants. All the so-called species listed under the names *Iris neglecta, I. hybrida,* and *I. plicata* are of this nature. They are only strains bred up from *Iris pallida, I. sambucina* and *I. variegata.* An iris fancier has therefore two ways open to him. He may collect the more handsome named sorts or he may go in for the botanical species. By the first method he will secure more



The Japanese Iris is one of the most beautiful.

(Courtesy of Meehans' Garden Bulletin.)

varied flowers; by the second, more interesting specimens. If he is collecting species, however, he should beware of all plants bearing fanciful names. Specimens bearing the names of gardeners, noted men and the like are pretty certain to be hybrids or varities. Of the botanical species, some of the best to start with, in addition to those already mentioned are *longipetala, verna, Missouriensis, Sibirica, pumila, cypriana, flavescens, benacensis* and *pallida dalmatica*. All these belong to the section having rhizomes. Of the so-called bulbous section the Spanish iris *(Iris xiphium)*, the English iris *(Iris xiphioides)* and the netted iris *(Iris reticulata)* with their varieties are most desirable. The best time to divide or transplant the irises is just after growth ceases or as it is beginning. Those species which rest in summer are best planted in early autumn, though they may be moved in early spring with the others.



THE MOUNTAIN SPLEENWORT AND ITS RELATIVES

By Willard N. Clute.

IT does not take a beginning fern student long to discover that most ferns have rather definite habitats. Though swamp and bog may seem nearly synonymous in our everyday speech, they are by no means the same to ferns and each has its appropriate species. The same is true of rock-loving ferns which, with few exceptions, will not grow anywhere except on rocks and even there are found to have a perception of the differences between different rocks that would do credit to a mineralogist. The fondness of the walking fern and cliff brake for limestone is well known, and, while we cannot say that these plants are never found on other kinds of rocks, the instances when they are, are sufficiently remarkable to be noteworthy.

As a general thing, sandstones have the poorest fern flora, shales seldom harbor the rarities beloved of the fern collector, granites are the homes of several interesting species, and limestone supports the most luxuriant and varied flora of all. It is not to be inferred, however, that the first ledge of limestone will contain all or even any of the rarities. These plants have a most perplexing and seemingly capricious way of occurring in unexpected places, and the collector may ransack the cliffs by the hour without finding any but common species and finally discover, often by the merest accident, a colony of some long-sought plants ensconced in a cranny that is all but inaccessible.

Mountain Spleenwort. It roots in crannies so narrow that it can only be dug out with difficulty.

Among the most interesting of the rock ferns are the *Aspleniums.* The novice regards them with favor because each form is so clear-cut that he seldom has difficulty in identifying it, while the older student knows from long experience that finding some forms is so largely a matter of chance that the possibility of seeing them in a new situation adds zest to many a botanical outing. The *Aspleniums* as a group are not confined to any particular kind of rock, though different species may have individual peculiarities in this direction, and are seldom found far from their preferred habitats. Most of them prefer limestone or other rocks in which lime is present. The maidenhair spleenwort *(Asplenium trichomanes)* appears to be the least particular of the family as regards the kind of rock it inhabits and in consequence is found nearly throughout the world where rocks abound. It is likely to be the first member of the group to be found by the young collector and often is the only one for a long time. Other members of the family are more particular, not only as regards the rocky support, but as to climate, shade, moisture and other things as well. Temperature, for instance, plays a large part in the distribution of the green spleenwort *(Asplenium viride).* It spreads around the world in the Far North, but only occasionally creeps over the northern boundary into the United States. After the maidenhair spleenwort, the little wall rue or rue spleenwort *(Asplenium ruta-muraria)* is probably most often found. It is widely distributed in the Old World, growing on old walls as well as on rocks, but it never becomes so common with us. Though it ranges from Canada nearly to the Gulf, many ferns students have never seen it growing.

Still rarer is the mountain spleenwort *(Asplenium montanum)* shown in our illustration, which competes with the rue spleenwort in parts of its American range. In general appearance it is much like the better known species though its fronds are somewhat narrower and the pinnules less fan-shaped. In some localities it seems to be a fairly common species, but in many large areas it is marked rare or absent. Like many of its congeners, it roots in crannies so narrow that it can only be dug out with difficulty if at all, and it is probable that this habit, together with its small size has had much to do with preserving it from extinction. Its preference is for rather dryish rocks and it can endure some sunshine though it flourishes best in shade.

* * *

A FAVORITE WILDFLOWER

By Dr. W. W. Bailey.

WHILE in a general way we recognize trailing arbutus as a spring flower, we cannot fairly refer it to any particular spring month. Its annual appearance depends upon wider and more definite views of environment. Its natural range is from Newfoundland to the far Northwest and southward to Florida, though in its farthest southern range it is usually found only in hilly districts. Of course, then, the latitude and climate will prove important factors in the time of its appearance. To take an example, it would naturally be found earlier in New York than in Maine or the Maritime Provinces of Canada. Then, too, our seasons vary astonishingly from year to year, and while it might present itself in Rhode Island at one time in March, it more commonly waits till April and has no certain engagement even then. Every plant lover knows that early spring flowers are most capricious in their annual appearance, but by the middle of May the species bloom according to established schedule.

"Mayflower," then is, often a misnomer; in Nova Scotia, where it used to be graven on some of the small coins antecedent to the Dominion, the title is more appropriate. In southern New England it is usually in advanced bloom or even out of flower by May. I do not say "in fruit" as it rarely indulges in that method of propagation, relying rather upon its trails. Observation will reveal, too, a tendency to a separation of the sexes. Some flowers of the species are perfect, while others are strictly staminate or pistillate. The old terms, male and female, are usually avoided in modern botanical writings as modified views, too recondite for present discussion, now prevails. These are interesting from an evolutionary point of view, as going to show genetic connection between the lowest and highest plants.

Our plant's other popular name is equally erroneous and founded merely on a family resemblance to the actual arbutus, a shrub of Europe. The scientific apellation, *Epigaea repens,* is pretty and significant and denotes that it grows upon the ground—a fact, indeed, which both generic and specific names emphasize. "A creeping plant which grows upon the earth" is surely sufficiently redundant, not to say a bit absurd, but one is often better off for not being able to read one's libretto.

There are two very closely related species, ours and the very similar one of Japan. It may perhaps be remembered by some readers, and will interest all, that one of the observations which entitle Asa Gray to his world wide fame, is his discovery and proof that the plants of eastern North America, very closely resemble, and in many cases are identical with, those of eastern Asia. This subject is pleasantly discussed in Gray's "Darwiniana" in the Chapter entitled "Sequoia."

The use of a scientific name when euphonius is often desirable, as it is employed by the scientific world, hence the employment of latin as the court or diplomatic language. Ours is not as strict latin, even, as that of the church, but being devoid of verbs is easy to acquire. It is much too mongrelized with greek. "Mayflower," however, would convey either an erroneous or no idea to a Russian or a Japanese or even a Frenchman, and "arbutus" would confuse a Swiss or Italian having in mind a very different plant. I should add that I believe in employing the vernacular when pretty and befitting. Who would wish to sacrifice the dear old English names daisy (the "day's eye" of Chaucer), primrose (the "first rose"), clover, tansy, sweet marjoram, pimpernel, thyme, self-heal, and a host of others enshrined in our literature.

Arbutus loves to hide itself under masses of fallen leaves or pine needles and prefers a sandy soil. With a stick or cane one goes prodding among the rustling leaves, seeking for floral treasures. Suddenly, with a lucky "cast," as the angler would say, there is revealed a bed of rosy, blushing, flowers with spicy ineffable fragrance, as if the fragrant chalices had in some mystic way caught and transmuted the divine odors of pine, birch, fern, and partridge berry.

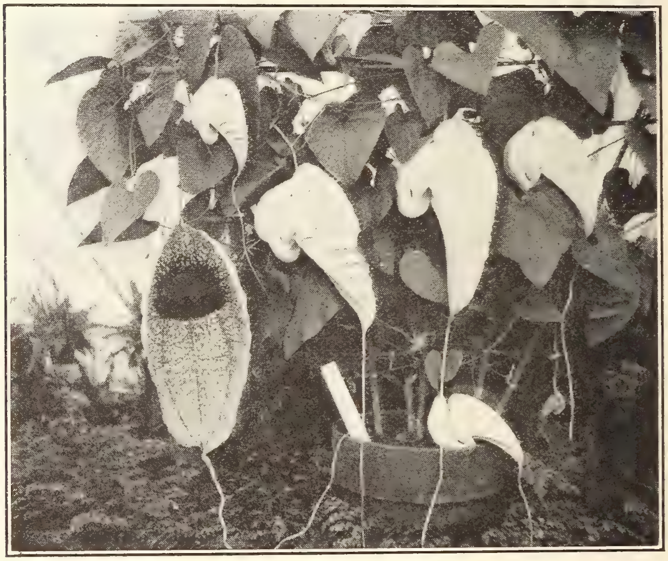
The humble plant never suggests the garden; indeed, it shrinks from coddling and is killed by over kindness. Very seldom, in my experience does it succeed in cultivation. Even with the best success, it is apt to run out after a season or two, unlike hepatica which takes lovingly to petting. Who of us "grown-ups," who of Dr. Holmes' "superfluous decade," can forget the far off days, when youth and maid together, we went hunting for the firstlings of spring. One who knows Epigaea only from the tinsel-bedecked, scrappy, handfuls sold on the city streets, has never seen the actual plant. It is cruelty to vegetation to treat it so. Pegasus cannot pull the plough; the born aristocrat will not take the arm of the bourgeois, nor the wild, shy arbutus seek city associates. She must be known in her chosen home under pines and oaks afar from city noise and dust.

Providence, R. I.

THE PELICAN PLANT

NOW and then, in the larger conservatories, one may come upon the curious pelican plant *(Aristolochia gigas)* in blossom. The flowers are worth going some distance to see for they are among the largest and most remarkable in the plant kingdom. In general shape they are not unlike the blossoms of the common Dutchman's pipe *(Aristolochia sipho),* a hardy vine native to the Mississippi valley, that is often planted for shade and ornament about porches, arbors and the like, but nobody who has seen only the small greenish flowers of this latter species can imagine those of its gigantic tropical relative. A few other flowers may possibly exceed it in the total spread of their parts, but if the measurements of our plant are taken across the widest part only, no other flower can equal it. Good specimens may measure nearly five feet across, these figures, of course, including the long slender, tail-like continuation of the corolla. Exclusive of the "tail," the broad, trumpet-shaped limb, as the border of the corolla is called, is frequently two feet long and a foot wide. We can quite believe the report that the children in the plant's native country often, in play, use the flowers for caps. They are certainly large enough for the purpose.

Viewed from the front, the flower has little to suggest the common name of the plant, but a side view presents a very striking resemblance to some large bird with neck bent and head reposing on its breast. The general color is a pale creamy white with the exception of the opening to the flower and the region immediately surrounding it, which is deep maroon. This latter color also spreads out in a network of purple veins which forms a fairly regular pattern on the upper surface of the flower. Practically all the members of the genus *Aristolochia* have flowers similar in shape to those of *Aristolochia gigas*. There is great variety, to be sure, in the shape of the corolla border and the curved corolla tube, but in all, a general and fundamental resemblance may be seen. This is accounted for by the fact that the flowers are all pollinated in much the same way and that the peculiar form is necessary to carry out the designs of the plant. The whole process of pollination is very curious and is performed for the most part by small insects. To attract these, the flowers have a strong and, to us, usually disagreeable odor, though it seems to be agreeable enough to the insects which visit them in large numbers. The odor of the species illustrated is said by some to resemble that of old tobacco, while others report it as



The Pelican plant *(Aristolochia gigas)*.

(Courtesy of Gardeners' Chronicle.)

nauseating. The writer has not found it very noticeable in any way. The insects attracted to the flower, and guided by the colored throat of the corolla, swarm into the corolla tube where they encounter a zone of stiff hairs pointing inward. These act as a sort of trap. It is easy enough for the insects to push further into the flower, but when they attempt to return, the zone of hairs bars the way. The insects are thus kept prisoners, often for several days. The flower provides for its guests, however, and they are said to exhibit no desire to escape. When the flower first blooms, the stamens are immature but the stigma is receptive. If the visiting insects have come from another flower, pollination is soon effected. The insects are not released, however, until the stamens have ripened. When this occurs the visitors are showered with pollen and immediately thereafter the zone of hairs withers and they escape to visit some other flower and repeat the process.

The family to which the pelican plant belongs is known as the Aristolochiaceae and contains nearly two hundred species. The climbing species mostly belong to the genus *Aristolochia* while the ground-loving forms are found in the genus *Asarum*. The majority are found in the warmer parts of the world and are especially abundant in Central and South America. The species under discussion comes from Nicaragua. The *Aristolochias* do not usually spread far beyond the tropics, though there are several species in our Southern States and the Dutchman's pipe reaches Minnesota. The members of the genus *Asarum* are less impressed by the cold and may be found in many parts of the North Temperate Zone, both in Europe and America. The well-known birthwort or Canada ginger *(Asarum Canadense)*, with heart-shaped leaves and dull red flowers borne close to the earth, is our most familiar species.

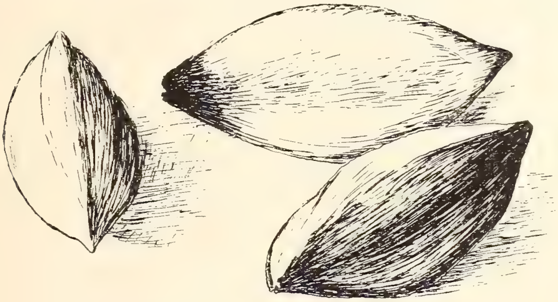
The specimen from which our illustration was made was grown by William Kleinheinz at Ogontz, Pa. In our latitude the plant must, of course, be grown under glass. It is said to do well in a temperature of 55 to 58 degrees and ordinarily flowers twice a year.

CULTIVATED VARITIES.—Regarding the forms of creation Linnaeus wrote that "there are as many different species as the Infinite Being created in the beginning" and this idea has largely prevailed in the public mind to the present day. It is a mistake, however, to assume that species are unchanging or that new forms appear only at long intervals. As a matter of fact, such forms arise annually. One has only to visit the nearest large area of plants in flower to discover many of them, and the principal reason they do not persist and become distinct species is because the type from which they spring is better adjusted to the surroundings than they are. If one will take the trouble to protect these aberrant forms they may be continued indefinitely and their peculiarities accentuated. It is such care and cultivation that have given us the many forms of garden flowers, often a hundred or more from a single original species. The catalogue of any seedsman will present much evidence on this point. Someone who has been investigating the matter reports that of pinks there are 50 forms, of petunias 57, pansies 62, poppies 68, nasturtiums 78, chrysanthemums 109, sweet peas 166, pyrethrums 180, larkspurs 218, carnations 224, phloxes 346, asters 457 and peonies 657. If you have a favorite flower of which you would like a new variety, sow plenty of seeds, select your own variety and breed it up.

THE PELI NUT

By Willard N. Clute.

A NEW kind of nut is beginning to appear in our markets. As yet it is so rare as to be somewhat exclusive and is not likely to be found anywhere except in the best shops where it mingles on terms of equality with the litchee, the pinyon, the pistachio and various foreign fruits. In time it may come to the indignity of being included in "mixed nuts" and thus become familiar to everybody. Though still rare it has already acquired a fine collection of common names and is known as paradise-nut, angel-nut, Hawaiian cream-nut and angle-nut. To these must also be added the names it bears in its home land, the most familiar of which are Java almond, peli-nut and kanari or canary-nut. The name of paradise-nut, by which it is most frequently known in our shops, is evidently a misnomer due to confusing it with the seeds of the real paradise-nut, a South American species related to the Brazil-nut.



The Peli-nut resembles the Brazil-nut.

In appearance the peli-nut suggests the Brazil-nut, though it is not easy to say how, for it is smooth where the Brazil-nut is rough, is sharp-pointed instead of blunt, and in cross section forms an equilateral triangle, while a similar section of the Brazil-nut inclines to the form known as an isoceles triangle. Though suggesting the Brazil-nut, it happens that the two species are not closely related. Our species is the seed of a drupe-like fruit produced by a tropical tree belonging to the Balsiminaceae, a plant family represented in our region by the familiar touch-me-not *(Impatiens)* of moist grounds and the common lady's-slipper of old fashioned gardens. The genus to which it belongs, is called *Canarium* and includes a considerable number of evergreen trees scattered through the East Indies and adjacent lands. The nuts that come to market are said to be derived from *Canarium Luzonicum* or *C. commune.* They are plentiful in the Philippines and their recent appearance in our markets is doubtless due to the fact that the government of those islands is at present administered by Americans.

The kernel of the nut is soft and oily, with a mild flavor resembling an almond, though in taste, and shape also, it suggests the Brazil-nut. In the East Indies, an oil for cooking and lighting is expressed from the nuts. It is sold under the name of kanari-oil and is said to be better than cocoanut oil for these purposes. The wood of the several species of *Canarium* contains a fragrant resin which has some medicinal properties. One species called the black dammar tree yields a brilliant black gum occasionally used as a drug, and Manila elemi is another medicinal resin produced by an allied species.

THE COMMON POLYPODY

By Adella Prescott.

THERE is a happy-go-lucky air about the common polypody *(Polypodium vulgare)* when growing in its chosen haunts that gives it a peculiar charm. Distaining the rich leaf mold that fills the pockets of its beloved rocks it clings to the surface of the flat tops, making dense matted borders of vigorous green fronds along the edges of the larger rocks and spreading quite across the smaller ones. It is not a large fern, being rarely more than twelve or fifteen inches in height and often much smaller, but it holds its dark-green, leathery fronds with such confident and careless grace, even in the most precarious situations, that one cannot help noticing and admiring it.

While the polypody reaches its finest development on the surfaces of rocks, it does not demand any special kind and occasionally spills over onto stumps and roots of trees if they are fairly dry. In fact, the first polypodies I had the pleasure of finding, were on roots of trees at the base of a limestone cliff, but they were poor specimens indeed, compared with the thousands of sturdy plants I found growing on the top of great masses of conglomerate two years later. How they obtained food for such vigorous growth I cannot understand for many of the rocks were bare of soil and at best had but a scanty covering, but I have never seen more luxuriant growth and one need not be a sage to find a little sermon in a polypody-covered rock.

The fronds of the polypody are rather odd in outline, thick and leathery in texture and remain green all winter. They grow from a slender rootstock that creeps over the surface of the rocks and have a short slender stipe and narrowly pinnate or pinnatifid blade. The pinnules are linear, rather blunt and sometimes toothed, and bear on the back a double row of large yellowish sori mostly on the upper part of the frond. The fruit dots have no indusium and are borne on the ends of the veins. This species has a superficial resemblance to the Christmas fern *(Polystichum acrostichoides)* but the differences are many and easily found when one begins to look for them.

Our present species is found nearly throughout North America and has several varieties, of which *Cambricum,* originally found in Wales and but rarely in this country, is the most noted. This has a frond much broader than the type and the pinnae are cut nearly to the midrib. Other varieties are *angustum* with narrow toothed pinnules, *rotundatum,* with short rounded pinnules, and *cristatum* with pinnules forked and crested. All may be looked for with the type, though perhaps not often found.

SOWING SEEDS

TO those who have not tried it, nothing seems easier than getting plants of a desired kind. You simply plant the seeds, wait a few weeks and there are your plants. Unfortunately the process is not so simple. To be sure the weeds spring up without their seeds being planted at all and the young plants develop apace in spite of the gardener, but it is not so with cultivated things. All but the hardy few must be nursed and coddled and defended from their enemies often till long past infancy.

A little experience in planting will show that the seeds of different species vary greatly in the way they respond to the ministrations of the gardener. Some will grow before they are mature, others as soon as mature, while a large number seem to insist upon a period of rest and will not grow until they have had it. Still other seeds are known which will not germinate until more than one growing season has passed.

As a general thing, the seeds of annuals are most easily induced to grow. With such plants it is usually "now or never." Their span of life is too short to admit of any delays. This circumstance may account for the fact that the plants most frequently grown from seeds in cottage gardens are annuals. They are so nearly certain to grow that they are prime favorites with inexperienced flower lovers. With perennials, however, it is different. The very seedlings seem to feel that they have plenty of time. They are often slow in appearing and still slower in developing, taking months to produce substance that would not keep an annual busy for a week. The majority do not bloom at all the first season and some even require two or three years to reach blooming size.

It is these slow growing perennials that give the gardener the most trouble, though they are usually worth it because of the number of years that the plants produce flowers when once established. Under greenhouse conditions the grower expects every viable seed to produce a plant, but when seeds are sown in the ground out of doors, such expectations are seldom realized. There may be reasons why fresh looking seeds will not grow indoors or out. They may have been gathered before they were mature, they may have been frozen before they were thoroughly dried, or they may be too old. The nature of the food store is seeds may also affect this latter result, starchy seeds commonly remaining viable much longer than seeds containing oil. In some specimens, such as the canna, lotus, and our fruit and nut trees, the testa is so impervious to water that they may fail to grow for a long time if a hole is not filed through the protecting cover. Sometimes boiling water is poured over such seeds to hasten germination. Stone fruits, such as peach and cherry are usually planted in fall so that the frost may split the testas, or they are stratified in a box of moist sand and kept damp until spring.

If one would have success with seeds planted in the open ground, there are several things that must be taken into account. First of all the soil should be warm and well pulverized. Seeds of the hardy annuals and perennials may be sown as soon as the ground can be worked in spring and some may even be sown the previous autumn, but with seeds about which there is any doubt, there is no advantage, and there may be some loss, by being in too great a hurry to plant. The seeds of perennial plants are often not planted until June or later.

After seeds are planted, the surface of the ground should not be allowed to dry out. This is probably the most important single condition in raising seedings. It is not enough to water the soil daily, for if the very surface becomes dry between waterings it may affect the result. Alternate watering and drying is also likely to puddle the soil and form a crust over it through which the seedlings have difficulty in pushing. The best way is to cover each row as soon as planted with a light mulch of straw, lawn clippings, or the like. This keeps the soil from crusting over, holds in the moisture, and renders daily watering unnecessary. When the young plants appear, part of the mulch may be removed and the remainder left to keep the ground from drying out, the plants growing up through it. Old newspapers or cloth may be used instead of the mulch though they are not so good since they must be removed entirely as soon as the seedlings appear.

In sowing seeds a good rule is to place them four times their depth in the soil. Very small seeds are simply scattered on the surface and lightly pressed into the soil. These latter, especially, should be covered with a mulch, since many seeds will not grow when exposed to the light, even if the surface is kept moist. It is not always desirable to firm the soil over seeds. It depends somewhat on the nature of the ground in which they are planted. The object in compacting the soil is to bring the seeds into contact with as many moist particles of earth as possible, but when a mulch is maintained this is not necessary and in clay soils it may be harmful by forming a surface too hard for the young plants to penetrate.

After the seedlings appear one is not always warranted in assuming that success has been attained. In plants that form partnerships with the bacteria, such as the legumes—plants belonging to the pea family—the proper bacteria may be absent and thus the young plants may languish and die.

One can never tell until he tries, however, and if success is possible, it may be most easily attained by keeping in mind the rules laid down in this article.

EBONY SPLEENWORT AND SHINING CLUB MOSS IN NORTHWEST INDIANA

By Edwin D. Hull.

The "Fern Flora of Indiana" in the *Fern Bulletin* for October, 1911, does not record the ebony spleenwort *(Asplenium platyneuron)* from the northern part of the state except in the extreme northeastern portion. On October 12, 1912, in company with a class from the University of Chicago, I found a single juvenile specimen of this fern on the eastern slope of a large sand dune somewhat near Lake Michigan in Porter County. The dune had long been covered with vegetation which accounts for the occurrence of such a plant. It was associated with the common maidenhair *(Adiantum pedatum)* which was fairly abundant. Other specimens might have been found if time permitted. The occurrence of such a fern in the dune region is remarkable and it is certain that there are very few places where it could exist.

Lycopodium lucidulum is another fernwort that the "Fern Flora of Indiana" does not record from Lake County. On November 30, 1912, I found two specimens on the south border of the bed of the old Calumet river at Millers. The nearest locality to Millers where I have seen the plant is near Sawyer, Berrien County, Michigan. Both the plants found were much dwarfed, being not over 7 cm. tall in vigor falling far behind those seen in Michigan, so it appears likely that the Indiana habitat is not favorable. One plant had a very few sporangia in the axils of the upper leaves; the other had none, but on both abundant gemmae occurred. The plants are in my collection.

NOTE *and* COMMENT

An Evergreen Climber.—It is a difficult matter to find climbing vines that will retain their leaves through the winter in our climate. The Japanese honeysuckle *(Lonicera Japonica)* approaches this condition in mild winters but it cannot be depended on. According to a writer in *The Garden Magazine* a vine that completely fits the description is another Japanese plant known as *Euonymus radicans* var. *vegetus.* This species is related to our common bittersweet and burning bush and like them bears orange capsules that ultimately split open and display the red-arilled seeds which last nearly through the winter. The leaves are said to endure the winters of New England unharmed. In northern regions, however, it will doubtless succeed best on north walls or in other situations where it is protected from the effects of the winter sun. The plant climbs readily by adventitious roots and so does not need special supports. It may be noted in passing that the name of the genus to which our plant belongs is no longer spelled *Euonymus.* At the time the name was first applied the alphabet was not as rich as it now is and lacked the letter u. In consequence many of the words we now spell with a u were originally spelled with a v. This is true of *Euonymus* and taxonomists actually expect us to make it *Evonymus* in future.

New Source of Paper.—A large number of plants can be made into paper, but the value of the produce depends a great deal upon the nature of the plant tissue used. The fibers must be of a size to mat into smooth firm paper and strong enough to endure considerable strain. Few plant substances possess all the necessary qualifications. The paper made from cornstalks, for instance, is too weak for many uses, while that made from manilla hemp is one of the strongest known, being exceeded only by some of the tough papers of the Japanese which are supposed to be made from the paper mulberry and bamboo. The steady demand for tough papers that can be produced cheaply incline paper makers to examine with care every promising source of material. According to a recent *Kew Bulletin,* this quest for new paper stock has led to a very favorable report on a plant belonging to the ginger family. The plant, which has no common name, is known to botanists as *Hedychium coronarium.* It reaches a height of ten feet or more and when growing looks much like the common canna so frequently used in decorative planting. Not only is the paper made from it a third stronger than manilla, but owing to the plant's possession of certain cells containing mucilage, it has many of the qualities of parchment and without first undergoing the special preparation necessary with other papers, will take ink without blotting. The *Hedychium* plant is a tropical species that thrives in moist places. The prospect of making tropical swamps yield a valuable return through the growth of this plant seems now most favorable.

Mycosymbiotic Plants.—The word mycosymbiotic has been devised to characterize those flowering plants which depend for at least a part of their food upon an association with fungi. Parasites, as is well known, depend entirely upon other living species for food, while saprophytes differ from these only in securing food from dead organisms. In both these groups the advantage of the association is all on one side, but in a third group where the association is known as symbiosis, two plants, usually a colorless fungus and a nearly independent green plant, form a partnership in which each gains something. The fungus may secure water for the green plant and receive in return food elaborated by its partner.

In this group belong the mycosymbiotic plants. Nobody seems to know just why or how independent green plants have come to depend upon fungi in this way but the habit seems to be very wide spread and new instances of it are constantly coming to light. Many, if not all, the species of orchids, lilies, pinks, amaryllises, saxifrages, oaks, legumes, gentians, heaths, figworts, and conifers, and species allied to them, are believed to have the habit. Some of the puzzling questions involved in the distribution of plants appear to be connected in various ways with such phenomena.

MANGANESE AND SULPHUR FOR PLANTS.—In all the books we are told that there are only ten chemical elements absolutely needed by plants in building up vegetable substance. These ten are oxygen, hydrogen, nitrogen, carbon, iron, sulphur, phosphorus, calcium (lime), potassium (potash), and magnesium. It appears, however, that even these ten are not all used in plant substances though their presence in plants has been shown to be in some way connected with their well being. It has been conjectured that those elements found in plants that do not occur in plant substances are of use in promoting various plant processes in which other elements are used. Still other elements found in plants have long been reputed to be of no use whatever and their occurrence in the plant has been explained on the theory that they were dissolved in the soil water and entered the plant along with other solutes. Recent experiments, however, seem to show that even these may have unsuspected uses. An application of manganese, for instance, has been shown to increase the crop from twenty-five to fifty per cent. Since this element is not a necessary constituent of any of the manufactured products of plants, its stimulating effect probably comes from the influence it has on the chemical reactions between other elements. Sulphur is known to be absolutely necessary to plants and it has always been assumed that there is enough in practically all soils for the needs of plants, but the application of this substance either in the ordinary powdered form or as a sulphate has led to some unexpected results. Recent analyses have shown that plants use far more sulphur than has been suspected and it is possible that they may fail to do their best for lack of this element. The members of the cress family, especially, contain much sulphur, an ordinary crop of turnips or cabbage removing nearly a hundred pounds per acre. Other crops use from fifty to seventy-five pounds per acre. Sulphur is known to be a powerful germicide and it is possible that some of its beneficial effect on crops comes from its influences on these organisms.

Reason for Protecting Plants.—It doesn't matter in the least how you protect your plants, trees and shrubs this winter so long as you get certain results. We wear clothes, not only to keep us warm but to avoid sunburn and mosquito bites. In the same way we mulch and wrap and bank up the garden for several diverse purposes. Many of our fruits, flowers and vegetables are existing under conditions far different from those in which they originated, so when the weather gets severe it is only fair to make the surroundings as homelike as possible. These are the dangers against which we give winter protection. Low temperatures and cold winds, actual freezing of the moisture which ruptures and destroys the tissues, the heaving of alternately frozen and thawed heavy soil which tears plants out of the ground, the whipping and breaking of branches and vines by the wind, the scalding effects of direct sunlight, the unnatural winter growth stimulated by a few warm days, excessive drying out of the soil, and the breaking of branches overloaded by snow. Different plants are threatened by different dangers. Study their habits, natures, needs and use in your protective work not only straw and leaves but also plenty of reason and common sense.—*Garden Magazine.*

Death of Thomas Howell.—The death of Thomas Howell at Portland, Oregon, on December 3, 1912, removed from this life one of the most remarkable of botanists. It is reported that his educational opportunities were limited to a single term of six months in a log school house in the Northwest, yet notwithstanding this handicap, he became an acknowledged authority on the plants of his region and wrote a monumental work entitled "The Flora of Northwest America" in which he described a large number of new species he had discovered. There is a story, which may well be true, that Howell set up most of the type for this book, teaching himself the printers' trade in order to do so. Such feats were very characteristic of the man. Howell was born in Missouri seventy years ago and removed with his parents to the Northwest when he was but eight years old, the entire distance being covered by ox-team. His career may serve as an inspiration to students better situated who are inclined to murmur at their lack of opportunity.

Nuts that are not Nuts.—Let us take in illustration, some of the fruits that are popularly and erroneously called "nuts." Why is a Brazil-nut not a nut? Because it is a seed—one of many from a large box. Why is a peanut not a nut? Because it is a pod. Why is a walnut not a nut? Because it is the stone of a drupe. Why is a horse-chestnut not a nut? Because the fruit is really a capsule with big seeds. Why is a cocoanut not a nut? Because it is the stone of a large drupe with a leathery epicarp and fibrous mesocarp. The hazel has a typical nut with a sheath of succulent bracts at the base; the beech has three-sided nuts with woody external bracts; the acorn is a nut with an extra scaly cupule.—*From Thomson's "Biology of the Seasons."*

EDITORIAL

The editor of this magazine has the distinction of being the founder of no less than five scientific publications, four of which are still in existence. The oldest, the *Fern Bulletin,* has just completed a fifth of a century of uninterrupted publication and although possessed of sufficient circulation to enable it to keep up the pace for at least half a century longer, other considerations make it advisable for us to combine it with the *American Botanist* to make a single larger and stronger publication. The first number of the new issue is now before our readers.

For the benefit of our old subscribers as well as those who are now transferred from the *Fern Bulletin* list, we may say that the present is in no sense a special number designed to celebrate the combination, but is an example of exactly what we expect to issue regularly in future. We are confident that it is now a magazine that every botanist and botanizer will find worthy of support.

In view of the increased cost of manufacture, we have decided to advance the price a bit and from this date, the magazine will be $1.00 a year payable in advance. All special offers and reduced rates are hereby withdrawn. It is not intended, however, that this advance in price shall affect permanent subscribers. These may renew annually as long as they please at the old rate of 75 cents a year. This privilege is also extended to any former subscriber of this magazine, or of the *Fern Bulletin,* who subscribes before March 31, 1913.

There is no botanical magazine in the world that offers so much for so little and we trust that all who have ever been on our subscription lists will order the new magazine.

* * *

With this issue we begin paying for all contributions used. The amount at present is not large, but it is at least a beginning and more than any of the other botanical magazines pay. Our way has always been to begin on a scale that we know can be carried through and to increase as circumstances warrant. For this year, then, we shall offer 25 cents a page, payable on publication. Less than three-fourths of a page will not count, though we will pay 25 cents for each item of half a page or over that can be used in Note and Comment. We expect all contributors to be subscribers and if they are not paid for a year in advance when the article appears, they will be charged for a year's subscription and the amount deducted from the amount due. Illustrated articles are especially desired, though we shall continue to value brains above the camera.

A word may also be added as to the kind of articles we want. First of all they should be short, and they should avoid the categorical. Contributions consisting of a set of paragraphs, each of which relates to a different species are, therefore, not likely to find favor with us. When you feel the inclination to write such an article coming on, flee to the back yard and contemplate the lusty burdock or the pugnacious Canada thistle. Properly considered either would make a more acceptable article. Nor is it necessary to roam far afield for subjects. Attractive articles are largely a matter of close observation, real thinking and a new viewpoint, and can be woven around the commonest plant in the vicinity. Think of the plant that interests you most, set down in good English the things that attract you and send it in. And forget botanical descriptions. Nobody but old Professor Dry-as-dust reads them, anyhow, and he is not a subscriber to this magazine.

* * *

To those into whose hands a sample copy of this number comes we make the following offer: Upon receipt of 75 cents, we will send this magazine for one year, beginning with the next number. This will make five issues for the price of four, and also entitle you to renew annually at the reduced rate. This offer will not apply to subscriptions received through subscription agencies, nor to those received in combination with other magazines, and it will not hold good after the next number is printed. If you ever expect to subscribe for this magazine, now is the time to do it.

BOOKS AND WRITERS

What is an individual? The question at first glance seems absurd, but after following Julian S. Huxley through his little book "The Individual in the Animal Kingdom" it assumes a new significance. The ordinary individual is easily recognized, but how about such forms as the liver fluke which in its life cycle has several different and distinct forms? Is each an individual or part of an individual? Is a sponge an individual or does individuality reside in the separate cells? And if an individual comprises all the protoplasm that is necessary to complete its life cycle, shall the pronuba moth and the yucca, neither of which can complete its life history without the other, be called two individuals or one? Lichens, though composed of an alga and a fungus, are surely individuals, but if so, are trusts, or the state, in the same category? The subject is discussed from many angles in the 160 pages of the book mentioned and is likely to form interesting reading for the philosophically inclined. The book is published by G. P. Putnam's Sons, New York, at 40 cents, *net*.

In "Agricultural Education in the Public Schools," Prof. B. M. Davis discusses all the agencies in this country that have helped to advance the art of agriculture. In addition to such universally recognized aids as the United States Department of Agriculture, the State Normal Schools, Agricultural Colleges and High Schools, he includes boys' Agricultural Clubs, Agricultural Societies, Educational Publications and Periodical Literature. The book is not quite a history of the development of agriculture in America, nor yet a summary of what has been done; it is rather an encyclopedia to which the student can turn for guidance in investigating any phase of the subject. A bibliography of more than two hundred titles, with notes, also facilitates this work. Such a book will be specially appreciated by teachers who find themselves in positions where the teaching of agriculture is among the requirements. It is an octavo of 170 pages and is published by the University of Chicago Press at $1.00 net.

"Agronomy; a Course in Practical Gardening for High Schools" is the title of a new book, by the editor of this magazine, just issued by Ginn & Co. This volume, while it discusses the principles fundamental to any system of agriculture is designed especially for schools in cities and towns and takes up subjects likely to be of most use to an urban population. The author regards agriculture as being divided into two coordinate branches, agronomy and animal husbandry, and all discussion of farm animals and their products is therefore omitted. In its place are several chapters on landscape gardening and the making of lawns, borders and the like. Earlier chapters take up such matters as soils, fertilizers, weeds, till-, age and the influence of light, warmth and moisture on the plant, while pruning, spraying, propagation, and plant breeding receive adequate attention. Each chapter discusses the principles involved and is followed by directions for practical work. Every effort has been made to show the city child how to make the best of his surroundings and at the same time to fit him to take up the more serious work of farming should his situation make this desirable. The work centers in the school garden and is planned to cover the spring semester. The book is an octavo of 300 pages and has nearly 200 illustrations. Owing to the fact that it deals with all the fundamentals of plant growing, it is believed that the book will prove a valuable garden manual for the general reader.

Books on weeds are much less abundant than the importance of the subject would seem to warrant. There is, to be sure, a long list of state and government publications on single weeds and weeds in groups, on how they harm crops and how to eradicate them, and many kindred subjects, but of books that deal with the subject in all its phases, there is something of a dearth. A few books of the kind have appeared, however, and one of the best of these is L. H. Pammel's "Weeds of the Farm and Garden" published by the Orange Judd Company. About half of the 275 pages in the book are devoted to descriptions of our weeds with notes on their distribution, abundance, hatitats and uses, if any. In the first half of the book, the harmfulness of weeds is discussed, their means of dispersal described, and the best methods of eradicating them outlined. In addition to being a thorough guide to the destruction of weeds, it is also a handy manual by means of which the cultivator can readily identify any new weed that may make its appearance in his fields.

Vol. 19. No. 2 Whole Number 97

THE AMERICAN BOTANIST

MAY, 1913

25 Cents a Copy; $1.00 a Year

Smithsonian Institution
JAN 14 1914

WILLARD N. CLUTE & CO.
JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

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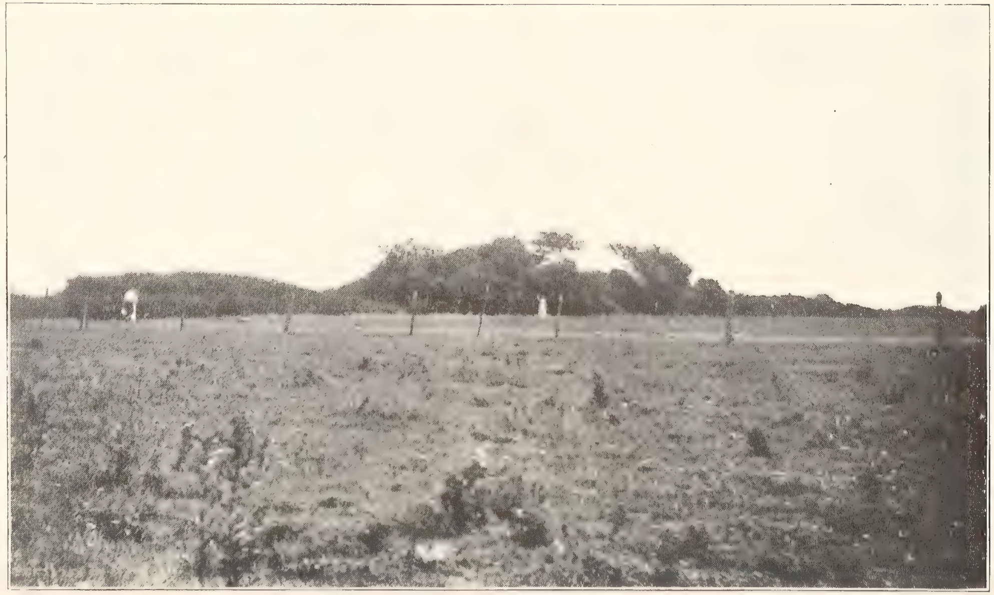


PLUM ISLAND.

THE AMERICAN BOTANIST

VOL. XIX JOLIET, ILL., MAY, 1913 No. 2

The golden nurslings of the May
In splendor strew the spangled green,
And hues of tender beauty play,
Entangled where the willows lean.

Mark how the rippled currents flow;
What lustres on the meadows lie!
And hark! the songsters come and go,
And trill between the earth and sky.

—Stedman.

THE ORIGIN OF THE PLUM ISLAND FLORA

By Willard N. Clute.

THE Chicago Plain, which extends in a broad belt around the southern end of Lake Michigan and on which the city of Chicago is built, is essentially a prairie, though one which differs in several respects from the ordinary type on account of its origin and soil characteristics. Originally the bottom of a shallow lake, and at present raised less than twenty feet above the level of Lake Michigan, its nearly level surface is covered with a flora in which prairie plants overwhelmingly predominate, though many of these belong to the "low prairie" association and delight in moist and swampy spots.

The moraine, which forms the western and southern border of the plain and once held back the waters of glacial Lake Chicago, is well forested, but there are practically no trees or shrubs on the plain with the exception of an occasional willow or cottonwood on the borders of the marshes or sluggish streams. Near the southern margin of the plain, however, there is a single long, low area of woody vegetation that stands out so conspicuously from the surrounding region, like an island of trees and shrubs in a sea of herbaceous prairie species, as to attract the attention of every botanist who passes that way. This is known as Plum Island in allusion to the dense thicket of wild plum that forms the axis of the area.

The occurrence of this group of woody plants in the midst of a typically prairie flora affords an interesting study of relationships that exist between two dissimilar but contiguous floras. It is well known that the plant covering of any region is more or less unstable. In any plant association there are likely to be small changes as species succeeds species or one overwhelms another, but when two such distinct floras as these meet, the struggle is likely to assume more strenuous lines since, owing to the nature of the plants, they cannot intermingle and one must tend to displace the other. The question of how Plum Island came to be, therefore, is one of considerable interest and a definite answer should throw an interesting light on the problem of whether the forest is succeeding the prairie or the reverse. Is Plum Island increasing in size or is it being surrounded and driven out by the prairie?

A cursory examination of the region shows that practically all of the woody species in the island are represented on the nearby moraine, and a closer study of the individual species composing it brings out the fact that only eight of the herbaceous plants in the island are common to the prairie also. The line between the two floras is thus seen to be sharply drawn. Of the forty-six species of plants found in the island, more than two-thirds are plants of the moraine. The woody species include the black and burr oaks, the black cherry, the choke cherry, wild plum, wild crab, thorn apple, wild rose, blackberry, red raspberry, black raspberry, common elder, smooth sumac, red dogwood, silky cornel, hazelnut, wild grape, bittersweet and woodbine and the more conspicuous herbaceous species are Solomon's-seal, two species of smilax, two species of false Solomon's-seal, mandrake, strawberry, ground cherry, and two species of nightshade. These varieties form possibly 95% of the individual plants composing the island. Inquiring into their means of dispersal, the significant fact develops that all bear either berries or nuts and are thus adapted for distribution by birds or mammals. By far the greater number are avevectant or bird distributed.

Returning now, to the question of which flora is encroaching on the other, it is apparent that if the prairie had assumed the offensive, we should find more representatives of that flora in the island. Nor would the forest species be represented so overwhelmingly by bird distributed forms. We seem forced to conclude, therefore, that the forest is encroaching on the prairie. Such encroachment might occur at any point where the two floras meet, and evidences that Plum Island is increasing its bounds are not wanting, but the establishment of this isolated area in the prairie makes the problem very clearcut and points unmistakably to birds as the principal agents in furthering the work at this point.

Plum Island is at least thirty years old. The largest tree in it—a black oak—was recently cut down and showed twenty-six or more annual rings in cross section. There may, of course, have been other trees before it, but if so, no evidence of the fact can be found and all the other individuals in the island are certainly much younger. Reviewing all the conditions we may, in imagination, recall the series of events that resulted in the occurrence of this group of plants. A line fence parallels the long axis of the island and clustered about this are a number of boulders brought from the adjacent prairie. Doubtless in the shelter of these boulders young trees sprang up, their seeds brought in by small mammals. Protected in some measure by their surroundings from the fires that often sweep the prairie and make it treeless, they continued to grow, illustrating very nicely the considerable changes that may come to a region in response to some slight advantage afforded to certain plants. As the trees grew large enough to afford rest, food, or shelter to the birds crossing the plain, the planting must have proceeded with vigor. Many of the species now in the island are extremely aggressive when once established and we may expect to see our island assume much larger proportions in the future if man does not interpose his authority enforced by the axe and the brush-hook.

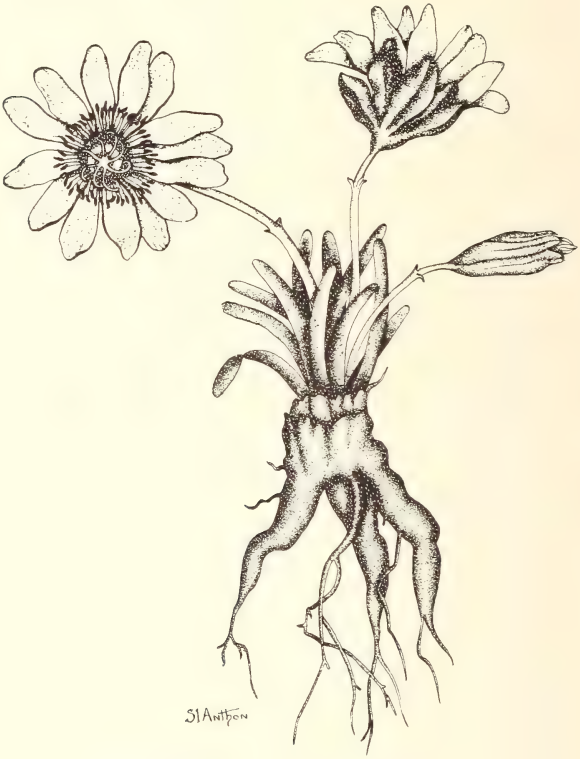
THE BITTERROOT

By S. I. Anthon.

Many of us from the Old World remember with mingled joy and sadness the storied flowers of our early playground. What a wealth of tales, legends, and bits of information about our commoner flowers were the heritage of every child. Instinctively we learned why the corn-flower was so blue and how the milkweed sent its children far off to explore the mighty world. So, too, we learned about the little boy who loved the two dainty bells of the twinflower so much that to this day when the gentle breeze flutters among them they nod their heads, whispering "Linnea, Linnea" in memory. What Englishman does not love his little daisy the more for its wealth of association in song and story? What Frenchman does not square his shoulders at the mere thought of the lilies of France being borne to victory? How the Irish exalt the humble shamrock and ascribe wonderful qualities to it!

Here in this new and cruder land we are so oppressed by the great amount of cold fact to be learned that we have had no time or thought to work out beautiful flower tales. We are even in danger of forgetting that every flower has a story value as well as a frigidly scientific one, and so we lose a host of spreading interests. It is in the attempt not to lose it altogether that I have tried to find, among others, the story that goes with the bitterroot, one of our common western flowers.

The bitterroot is one of those flowers that startle us by their sudden appearance in the spring. Over all our dry, loose soil in Eastern Washington, Montana, and Idaho the flowers fairly seem to pop out of the ground and burst into bloom. And their beauty is quite as entrancing as their sudden emergence. The rock-rose as it is perhaps more fittingly called, clearly shows its relation to our garden portulaca in its leaves. These form an irregular rosette of round, juicy looking filaments of a reddish green color with a markedly grainy surface. Below the leaves lies an irregularly forked root. This has usually several half-inch thick main branches and then a few thin fibers coming from these. The roots are brownish black in color. Each little plant bears a few flowers; flowers so dainty



The Bitterroot—one-half natural size.

and fairylike that it seems an impossibility that they could have arisen from so unpromising a desert. The bud sepals are of a dull green touched with red, but the open flower is the pink of our soft sunrises. A loose ring of petals, each petal showing fine darker lines radiating from the flower center, surround a host of red stamens which in turn make a complete ring about the pistil. The whole flower has a saucy airiness of manner that it is quite impossible to describe.

Entirely apart from the charm and interest of the plant is the history of its discovery and use. The flower ranges from British Columbia to Wyoming, having been first collected by Meriwether Lewis of the Lewis and Clark expedition across the continent to the Pacific in 1804. He found it on the banks of the Low Low Fork of the Bitterroot River in Montana. In his journal Lewis says in describing some of the dried roots—"it was of a cylindrical form, hard and brittle. A part of the rind which had not been detached in the preparation was hard and black, but the rest of the root was perfectly white."

The Kon-ah, as the Indians call the bitterroot, is particularly abundant in the Bitterroot Valley, which takes its name from this fact. Because of its beauty and interest it was chosen by vote of the people as the State flower of Montana. It was given the name *rediviva* as the roots will revive after being in a herbarium for several years. Indeed, it is almost impossible to obtain a good herbarium specimen as the plant seems to retain enough vigor to ripen flowers even after being dry and under a heavy weight. I well remember my own disgust at my many times repeated efforts to secure an acceptable specimen.

This starchy root is dug by the Indians in spring, the Flatheads in particular digging large quantities of it in May, when it is at its best. After being dried it keeps for years. Lewis says, "This the Indians informed us was always boiled before eating; and on making the experiment we found that it became perfectly soft, but had a bitter taste which was nauseous to us, though the Indians seemed to like it; for on giving the roots to them, they were heartily swallowed."

Upon first hearing of this fact about the root, I spent an exceedingly hot and laborious hour in my desire to investigate its palatableness. After covering myself with dust and perspiration I secured enough roots to cook, but while it may be very nutritious I found it had an exceedingly bitter taste and I do not wonder that the white man has never learned to like it.

NOTES ON THE FERN FLORA OF MICHIGAN

By Edwin D. Hull.

THE following notes on Michigan ferns seem worthy of record inasmuch as they supplement the "Fern Flora of Michigan" by C. K. Dodge in the *Fern Bulletin* for January, 1912. The plants were collected while with a class from the University of Chicago, October 19, 1912, near Sawyer, Berrien County. *Polypodium Vulgare,* the common polypody, is reported as being "infrequent in the lower peninsula" but it is certainly common here in at least one locality, at the summit of a large dune standing nearest the lake. Prince (*Fern Bulletin 20:* 52, 1912) also records this species on sand dunes in the lower peninsula. Most of the plants were much dwarfed, averaging about 10 cm. in height, but nearly all were spore-bearing. The narrow-leaved spleenwort (*Asplenium angustifolium*), not previously reported from this county, was found in beech woods with the Christmas fern. The latter was rather common but much less so than its associate. The ternate-leaved grape fern (*Botrychium obliquum*) has not previously been reported from this county. It grew in an open mixed wood. Several specimens were found but the plant does not seem to be common. *Botrychium obliquum dissectum* also not previously reported was found with the typical form and in about the same numbers.

A CURIOUS MULLEIN HABITAT

By Willard N. Clute.

THE banks of the streams in the vicinity of Joliet are for the most part formed of a rich black alluvial soil and the wearing of the meandering current constantly cuts them down on one side and as steadily builds them up on the other. Though they are seldom more than a few feet higher than the surface of the water, the almost perpendicular faces they present afford a fertile soil for any plant able to take and occupy it. As a matter of fact, the faces change so rapidly under the wearing of the current that few plants are able to maintain a root hold, but the situation is one that seems exactly to suit the common mullein (*Verbascum thapsus*) whose long tap-root rapidly penetrates the soil and holds the plant secure against even ordinary floods. In consequence, the banks of the streams wherever cutting by the current is in progress, are ornamented by a broad border of the gray-green leaves. The fields through which the streams flow are either cultivated or pastured, and the mulleins apparently find it hard to maintain an existence in them. Along the streams, however, there is practically nothing to dispute their supremacy. The illustration shows two views along Hickory creek near New Lenox where the plants are especially numerous.

The long roots of the mullein rapidly penetrate the soil and hold the plant secure against floods.

NARCISSUS BIFLORUS

By Georgia Torrey Drennan.

TWO peculiarities distinguish *Narcissus biflorus* from all other members of the Narcissus family. First, it blooms in June; never in the spring. All spring-flowering bulbs have bloomed and passed away before *N. biflorus* sends up its flower-stalks. The second peculiarity is that its flowers appear in pairs; never one, never three or more, but just two, invariably two blooms. They bud and expand simultaneously. Though not so pronounced, it has another characteristic of its own, in the odor which is distinctly balsamic. It suggests bruised balsam leaves or crushed resinous pine needles with an essence of spice intermingled.

The flowers are cup-and-saucer form. The cup is deep chrome yellow, the saucer or perianth flake white. The flower stems are straight, clean and about six inches tall. I have known *N. biflorus* since my earliest days, but not by the name here given. It was one of the components of all gardens of the old South, and is yet one of the commonest of bulbous flowers, known as the "June Narcissus." For some unaccountable reason, it either never had a place in catalogues of popular bulbs, or has been discarded for such a length of time that in no catalogues, either of past date or current, can I find it. I wanted to order the bulbs for my city garden, but could not find a dealer that understood my order. They all substituted *N. poeticus* and other well known kinds. I finally sent to the old plantation and had them dug up from where they had grown and naturalized themselves for so many years that the bulbs were crowded together in layers. This crowding of starved and neglected bulbs is the only thing I ever knew to make *N. biflorus* barren of blooms.

The plant is one of the hardiest and most prolific of all the narcissi, multiplying and blooming with unfailing regularity for years and years with almost no culture. When the roses, pinks and poppies make the June garden brilliant, this pure white narcissus adds the charm of sweet simplicity.

Why such an old and deservedly popular flower should not be known beyond local limits excited my interest and I went to the Howard Library in New Orleans to "read up" the botanies and find out its history. In old English botanies I found my flower, under the name I have here given. *Narcissus biflorus* or Primrose Peerless, is the way it is specified. The descriptions are all the same. "Hardy, healthy, free flowering, twin-flowered, blooming in June, with balsamic odor," as good for identification as a thumb print in a criminal case. Why the English called it Primrose Peerless, I am unable to say.

Mobile, Ala.

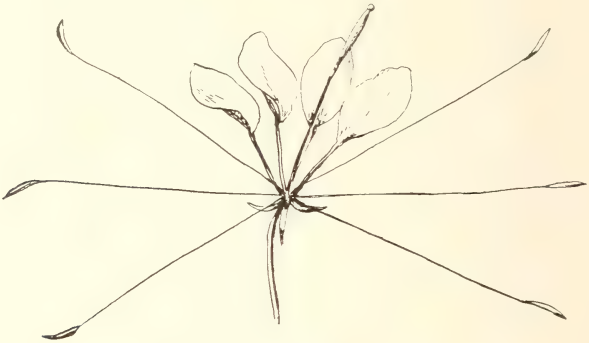
THE SPIDER FLOWER

By Willard N. Clute.

NATURE must have been in a jesting mood when she made the spider flower. Anyone who views its collection of sepals, petals and stamens will, of course, recognize it as a flower, though it is not likely to remind him of any other flowers of his acquaintance. The long and sprawling stamens, the petals all on one side, the ovary removed from the rest of the floral organs by a long stipe, and various other lesser peculiarities all conspire to make it unique among the inhabitants of our fields and gardens, and therefore of much interest to lovers of the curious in plant life. The structure of the flower also has an interesting bearing on the axiom that a flower is a transformed branch. In ordinary flowers the resemblance is not especially noticeable, but in the spider flower the different sets of floral organs are separated from one another by an appreciable interval and are arranged in whorls at the nodes much as leaves are, therefore the origin of one from the other is not difficult to imagine. It may be said in passing, however, that one is not to assume that a flower is really derived from a branch with leaves. All that is meant is that the leaves and floral parts have a common origin.

There are various species of spider flower in the West and South, but probably the most interesting is the one cultivated in gardens under the name of *Cleome pungens,* though I believe the botanists, speaking strictly by the book, would call our species *Cleome spinosa.* The seedsmen, however, rarely pay much attention to the whims of the botanist and the plant will doubtless continue to be listed under the old and well known name. *Cleome pungens,* then, is a plant of tropical America but it thrives in gardens as far north as Canada and from midsummer till frost displays in profusion its large rose-purple or white flowers. These open about sunset and last until a new set opens the following day.

The opening of the flower, however, is no such rapid process as may be witnessed in many species, the evening primrose for example, where the petals and sepals may be seen to spread open with a snap at the proper moment. In fact, the opening may be said to be a matter of several days' duration. The petals early outgrow the sepals, but before they are unfurled the impatient stamens have begun to back out of their embrace and the curved filaments projecting from the bud may be conspicuous for a day or more before the flower is fully spread. The stamens always push out on the under side of the flower, being guided in this direction by the arrangement of the petals which, though set in a circle on the receptacle, nevertheless have slightly more space between the two on the lower side. Coincident with the opening of the petals a large drop of nectar



The flower suggests a spider.

appears between the two upper stamens, being produced by a glandular tissue there. At first the petals stand nearly erect, as in our figure, but as the flower grows older they gradually sink downward until they take a position nearly in a semicircle on the upper side of the flower. By this time the stamens have spread stiffly outward, three on each side, and thus give the blossom a not very distant resemblance to a gigantic spider or to that creature familiar to children as "daddy-long-legs," though it is likely that neither of these animals would consider themselves in style with only six legs.

The arrangement of the parts of the flower indicates that in its native land it is pollinated by large insects and the further fact that the flowers open at sunset seems to imply that these visitors are night-flying moths. In our northern gardens, however, it is largely visited by butterflies and bees and the seedsmen often recommend it as an excellent honey plant. Whatever its visitors, it seldom fails to be pollinated. The flowers are odorless but the bruised foliage has a rank and heavy scent. In the West, an allied species is called skunkweed because of its odor, and for a similar reason the little *Polanisia,* a member of the same family, from northeastern America, has the specific name *graveolens.*

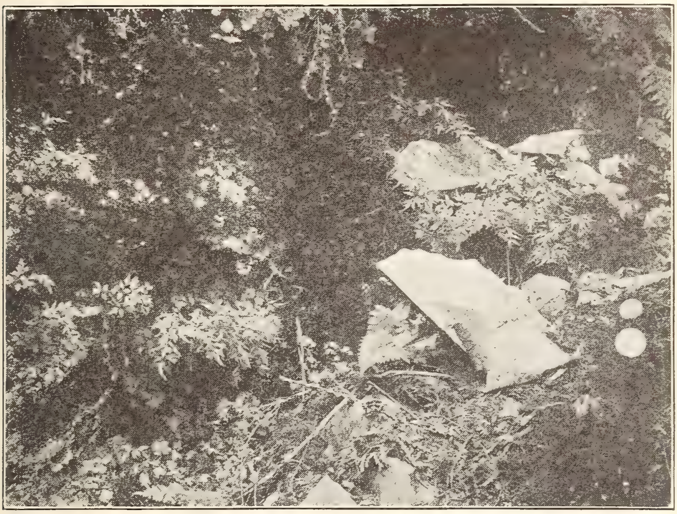
The family to which the spider flowers belongs is known as the Capparidaceae. Its best known representative is probably the caper tree from which comes a condiment much prized by the *chef.* The family is closely related to the great cress family. In both, the flowers have four sepals, four petals, six stamens and a single ovary composed of two carpels, but the fact that the stamens are all of the same length in the caperworts together with other minor differences is considered sufficient to ever keep the families apart.

THE SLENDER CLIFF-BRAKE

THE fern collector who finds the slender cliff-brake in his locality may consider himself fortunate. The species is not one of those elusive ones that occur sparingly here and there and are therefore likely to be overlooked; it often grows in great abundance where it occurs at all but it is not found in every place that appears suited to it, and in short, it is one of those plants which the botanist writes down as local without being able to discover what it is in the soil, surroundings, or plant predilections that makes it so.

It is the general impression that this plant is always associated with limestone rocks, but recently it has been reported several times on sandstones and more rarely on shales. Possibly one of the reasons it seems to prefer limestones is because such rocks are not only more likely to afford perennial supplies of moisture but they also provide the little ledges and shelves of rock on which the fern delights to grow. Many, perhaps the majority of plants that grow on cliffs, are true xerophytes and can get along with the minimum amount of water, but the cliff-brake is a mesophyte and is seldom found far from abundant moisture. If one hopes to find it in his locality he should search all the dripping ledges of limestone.

Although the cliff-brake is one of the smallest and most delicate of our ferns, it elects to grow in the colder parts of the world and encircles the earth north of the parallel of 40 degrees, North Latitude. Its farthest southern stations are in northern Pennsylvania, Illinois and Iowa but in all these States it is extremely rare. Nearer the Pole, however, it often completely covers the shaded ledges. It is very impatient of both sunshine and drouth. Cutting down the sheltering trees in its habitat is usually sufficient to cause it to disappear. In the event of drouth it simply casts its leaves and waits for another growing season. In dry summers it is difficult to find the fern after mid-July and even in years of more moisture it is probably the first of the ferns to disappear.



Little ledges and shelves of rock on which the fern delights to grow.

When found, the cliff-brake is easily recognized. There are no other ferns with fronds so delicate that grow in such a habitat. A further distinguishing mark is found in the two kinds of fronds, the sterile being much broader and shorter than the fertile though the latter are less than six inches long. The indusium under which the sporangia mature, is broad and thin and is formed from the margin of the frond. Some idea of the size of the plant may be gained from our illustration where the two round white spots near the right margin of the picture are a silver quarter and a penny.

SPRING FLOWERS OF PRAIRIE WOODS

IT is probable that nowhere are wildflowers more abundant than in a prairie region. Many people imagine that the warmth and light of the Tropics must make that part of the world especially favored in the matter of bloom, but this is a mistake. It is true there are a great many beautiful and showy flowers in the Tropics, but they are swallowed up and lost or obscured by the all-pervading green. Flowers are most noticeable, or possibly most abundant, in regions where the conditions for vegetation are less favorable—on mountain tops, in alpine valleys, on sand barrens, in the Arctic regions and in similar places. It may be doubted, however, if the prairie must yield to any of these. Nor are the forests that border the prairies

One must tread on flowers at every step.

less favored. As evidence we give a view from a vernal wood in the vicinity of Joliet where the ground is so nearly covered with flowers that it is literally true that one must tread on flowers at every step in passing through it. The flowers that make up this drift of blossoms are spring beauties, Dutchman's breeches, trilliums, violets and anemones. Later the same wood will be as thickly spread with phlox, collinsia, polemoniums, and the like, and these will in turn give way to several other groups before asters, goldenrods, and eupatoriums close the season.

ABNORMAL FRUITS OF JUGLANS REGIA

By J. A. Nieuwlands.

IN the December (1912) number of *Torreya,* there is a notice with drawing of a tricarpellary English Walnut, together with the theory that this is a reversion to a primitive type. Concerning the nature of the reversion in this particular case of teratology, we do not presume to express an opinion beyond this, that we do not see that it is necessary to explain such causes by the supposition that they are reversions to primitive conditions.

Though we have not made it a special point to search for abnormal "fruits" of *Juglans regia,* we may say that we have found such specimens as the one described and drawn, to be quite common. The fruit in question consists of three equally large carpel leaves and the same number of false partitions. We have, moreover, found two other abnormal fruits quite as interesting as the one referred to, both within a week of each other. These I have sent to the editor of this magazine and we have dissected only the more complex of the two. The first of these fruits is composed of three carpels. One of these is the size of the normal one in all walnuts, that is, a perfect half shell; the other two carpels are each but one-half the size of such. As to the internal structure, we have not investigated further.

The other walnut is made up of four distinct carpels all of about equal size and every one with a more or less notable false partition reaching inward and dividing the embryo cotyledons into eight more or less imperfect divisions. The embryo itself, at the radical end, has the shape of a four-sided pyramid. As already noted, we need not suppose that all abnormal fruits are to be interpreted as reversions to primitive or atavistic types. Years ago, we found a "fruit" of a member of the same family, *Hicoria alba*, the common hickory nut, that had four carpels or a double nut with a perfect partition between two perfectly normal healthy seeds. This condition would possibly have to be interpreted as a reversion to a still more primitive type. It seems quite satisfactory to consider all these as just abnormal conditions for which we need not rack our brains to find an explanation with very much hope of profit.

Notre Dame, Ind.

[In addition to what has been said above about abnormal fruits in the Juglandaceae, we may add that we have in our possession double fruits of both the black walnut (*Juglans nigra*) and the butternut (*Juglans cinera*). In these there are two perfectly formed seeds enclosed in a single husk. We also have a black walnut with three cotyledons. This latter specimen seems in no way very different from seeds of other kinds which occasionally produce seedlings with three cotyledons. In certain cases DeVries was able to breed a race of tricotyledons from such beginnings.—ED.]

AN ORNAMENTAL GARDEN PLANT

By Willard N. Clute.

In every well-appointed garden, there is sure to be a clump of chives in some out-of-the-way corner, for no cook worthy of the name would forego the added piquancy which the tender green leaves of this plant add to the salads and stews of early spring. But not to the taste, alone, does this old-fashioned and long-domesticated little plant appeal. Almost as soon as the snow is gone, certainly as soon as the ground is thawed, the innumerable slender green spears begin to push up, making lively splotches of color on the brown earth and prophesying spring long before the daffodil dares, to say nothing of the swallow.

Again in late May or early June the plants assume a new attractiveness when the clumps put forth large numbers of slender stems tipped with globular tufts of rosy-lilac blossoms. All who view it then are of the opinion that it is much too pretty to be considered a mere vegetable fit only to be eaten, and not a few, prompted by this feeling, have moved it into the society of choicer spirits whose main claim to consideration is the possession of beauty. In many situations it is an ornament to the flower garden. It is a clean, trim, compact, little plant with a good natured air about it that goes far to make one forget its plebeian origin.

Chives still grow wild in the colder parts of both Europe and America. On this side of the world the plant extends southward to the Great Lakes and the mountains of northern

New England. The American plant is regarded as slightly different from that of Europe and it is sometimes called the variety *Sibiricum*. The species is known as *Allium schoenoprasum* and it is probable that our cultivated plant has been derived from this. Unlike most plants belonging to the onion alliance the bulbs are never large and are seldom eaten. The leaves, however, are highly valued and little clumps of this plant form one of the staples of the green-grocer in spring. For a few cents one may get sufficient plants to start a good-sized border and owing to the rapidity with which they multiply he will soon have plenty for his neighbors.

Stems tipped with globular tufts of rosy lilac blossoms.

GOLDIE'S SHIELD FERN

By Adella Prescott.

THE first sight I had of Goldie's shield fern (*Nephrodium Goldieanum*) filled me with envy and despair—envy because it grew by the house of a stranger and despair because it was so beautiful that I thought it must be rare and rare things do not often come my way. I watched it for weeks with longing eyes but having the set of the little finger which palmists say indicates a lack of push, I got no nearer than the sidewalk until the family went away for a vacation and closed the house. Then I trespassed boldly, examined the fern often, and when the sori appeared it was easily identified. Later I found some fine specimens growing with their best-loved friend, the narrow-leaved spleenwort, in a near-by wood.

Of all our native ferns, I think Goldie's is easily the most beautiful if one excepts the royal fern and his other favorites! It is large enough to be stately, but it is never coarse as our other large ferns are likely to be. Whether growing singly or in clumps, it is always graceful, while its peculiar coloring gives it an added charm. It is one of our tallest ferns, often reaching three feet in height, while an extra fine specimen may add several inches more to its stature and the ovate fronds may be ten or twelve inches wide. They are nearly twice pinnate and the coloring is very noticeable, especially in the young fronds, being a deep blue-green at the center shading lighter at the edges and tips of the pinnules.

The fern grows from a creeping rootstalk but the fronds often are so close together as to suggest a crown. The fertile fronds are like the sterile, and the large sori are borne in a double row near the midvein. It has a wide distribution, being found from Canada southward to Tennessee, but it is often absent where it might be expected and is never as common as many of its kin. It takes kindly to cultivation and is a joy forever wherever grown.

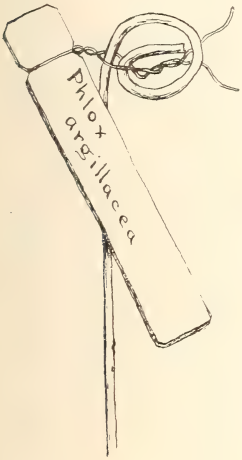
New Hartford, N. Y.

LABELS AND LABELLING

IN the old days, the gardener, after sowing his seeds, set up a small stick at the end of the row and placing the empty seed packet upon it considered that his work was done. In modern gardening, however, such careless methods are not to be tolerated. In many cases, especially where seeds of several varieties of a single species are planted, or where different forms of one species are grown together, it is important that a permanent and legible label be provided.

A considerable variety of labels are offered by dealers in seeds and nursery stock but all are not equally valuable. For temporary purposes such as marking the position of annuals, that kind called a pot label is as good as any. Such labels range in length from six to twenty inches and in width from half an inch to an inch or more, and they may be painted or plain. The objection to the smaller sizes of pot labels for permanent marks is that they easily become splashed with mud and therefore illegible after the spring rains. By the use of taller labels one avoids this trouble, but these latter labels are rather expensive and also rather too conspicuous to be desirable. A more satisfactory permanent marker may be made from a tree label, such as many nurserymen use in labelling trees and shrubs sent to customers, and a piece of number ten or twelve galvanized iron wire about two feet long. One end of the wire is bent into a small loop as shown in the illustration and the tree label is fastened to the loop. The straight end of the wire is thrust into the ground and the label thus held aloft remains legible for many years, especially if painted.

A good painted label is much superior to the unpainted kind, but such a label is hard to find, nowadays. The ingenious Yankees who make them, instead of giving them a good coat of paint, have taken to dipping them in a thin decoction of oil and color which makes them look as if painted though they do not give the same results. It is often advisable to get the unpainted labels and paint them at home to be sure of satisfactory work. In this case it is well to use good white paint, not too thick. If properly painted the marks of a common lead pencil will remain legible for six or seven years at least. For marking all permanent plants, the label we have described is one of the best to be had. Among other good kinds recommended, one is a strip of thin copper upon which the name is written or printed with a hard stylus. This makes an impression in the copper that is legible for years. Unfortunately the cost of such labels is much higher than for the wooden ones more commonly chosen. Strips of zinc are also often used. A name written in pencil on zinc will last a long time. These labels, however, like the tree labels, have to be raised above the soil in some manner, at least for herbaceous plants, and since they do not ordinarily last much longer than the wooden labels, have little to recommend them.



In writing labels, it is customary to write the different words composing the name on different lines to avoid confusion when the words begin to be illegible. The first word begins at the upper end of the label, near the outer edge and the next word is written below and a little further to the right. Pot labels stuck in the soil should always face away from the seeds they mark and in any considerable planting the rows should always be so arranged that the owner knows at which end the planting begins. Under these conditions, when several different plants occur in a single row, it will be easy to discover to which lot a given label refers.

NEW ZEALAND FERN NAMED

IN the *Fern Bulletin* for July, 1912, there was published a drawing of an unfamiliar fern frond which could not be named for want of fruiting material. To our request for its name, there was no reply from this side of the world, but Prof. A. Gepp of the British Museum, London, has kindly identified the plant. The fern is *Platyzoma microphylla* or, if you prefer, *Gleichenia platyzoma*. Judging from the appearance of the sterile fronds alone, the editor guessed that it might be a *Pellaea* or *Cheilanthes,* but it turns out to be only distantly related to those ferns; indeed, it does not belong to the same division of the fern family, being one of the Gleicheniaceae, a group coordinate with the Polypodiaceae to which the majority of ferns belong. The plant was originally described as the type of the genus *Platyzoma* but it has since been shown to be doubtfully distinct from *Gleichenia* and modern botanists now put it in that genus. The original specific name was *microphylla,* which is certainly descriptive enough, but when placed in *Gleichenia* it is often called *G. platyzoma.* According to such authorities as we have at hand, the fern is found only in Australia. The *Fern Bulletin* record for South Keppel Island, New Zealand, may therefore be an extension of range.

NOTE *and* COMMENT

The Ancient Arctic Flora.—Most people are familiar with the fact that coal is found at many places in both the Arctic and Antarctic regions which would seem to indicate pretty clearly that at some earlier period the climate in such regions was much milder than at present, since coal is formed of the remains of plants and plants cannot thrive in these ice-bound regions at present. Some geologists have attempted to show that the plants which formed this coal did not grow in the region but were carried to their present resting place by some large river or by ocean currents. This theory seems utterly untenable, however, for in many places the fossil coal plants are still rooted in the mud as in life. Many of the plants are so well preserved that the genus, and even the species, can be determined. Among the plant remains found in Spitzbergen are included species of redwood, cypress, maple, poplar, willow, alder, birch, hornbeam, hazel, beech, oak, elm, plane, magnolia, basswood, walnut, hickoy and ash, as well as many herbaceous plants.

Fern Bulletin in the Argentine.—Of the thirty-one complete sets of the *Fern Bulletin* known to exist, three are owned outside of the United States. Until recently we have been unable to locate the single set owned in South America, owing to the fact that it was purchased through a German agent, but a note from Dr. Cristobel M. Hicken, Professor of Botany in the University of Buenos Aires, Argentina, apprises us of the fact that the set is preserved in Dr. Hicken's private natural history museum, "Darwinion." The museum is one of the foremost in South America and contains a large number of herbarium specimens representing nearly 35,000 distinct species. Ferns are one of Dr. Hicken's specialties and are unusually well represented. Several illustrations of the museum appear in the August, 1912, number of *Physis* a natural history publication printed in Spanish.

WHITE SASSAFRAS.—Every country boy knows the sassafras and apparently some country boys know the plant better than the botanists do; at least, in some parts of our country, they have made a distinction between two forms of this plant which the botanists have rarely recognized. The more common form is sometimes called red sassafras and is the one bearing the scientific name *Sassafras variifolium* or *S. officinalis.* The less familiar form is known as white sassafras and has recently been listed in our flora as *S. variifolium* var. *albidum.* The white sassafras is a more glaucous plant than the common form and the roots are reported to possess more of the pungent property so characteristic of this species. It is said that the mountaineers of the Carolinas have always recognized the difference and invariably select the white form when digging the roots for the well known spring tonic, sassafras tea. Nuttall regarded this plant as a separate species, but it is now believed to be a mere form of the common sassafras.

VIOLA PEDATA AND ITS VARIETY.—The bird-foot violet (*Viola pedata*), is a common and well-known inhabitant of sandy or sterile areas from the Mississippi valley to the Atlantic Coast. In part of its range it presents two forms, the more common one having all the petals colored lavender or lilac purple and the other having the two upper petals deep purple and the remaining petals nearly white. By some twist in the nomenclature of the species, or some obliquity in the nomenclaturists themselves, the rare form is known as *V. pedata* and the common one as *V. pedata* var. *lineariloba.* The new Gray's Manual makes this distinction but Britton does not notice it.

The range of the species is given as from Southern New England to Maryland while the so-called form extends west to the Minnesota. Recently the species, that is, the one with two-colored flowers, has been reported from northern Illinois and one may be pardoned for thinking that the occurrence is due to some external influence, rather than to a fundamental or inherited characteristic. Certainly if Britton's Manual does not make it a species, its claim to even varietal rank must rest on no very solid basis. Those who encounter these plants this spring would do well to keep watch for both forms.

KRASCHENINNIKOWIA MAXIMOWICZIANA. — The non-botanical are wont to observe that the scientific names of plants are "fearfully and wonderfully made" and the name which stands as the title of this paragraph goes far to substantiate the statement. It also serves to illustrate the lack of perception in the typical scientist. Who, except the scientific man, too deeply engrossed in his work to see the humor of the situation, could give a pretty and delicate plant such an uncouth name as this? However, it is possible that in carping at this name we may be following the example of the ignorant who are prone to smile at unfamiliar words. Were we Russians the name of the plant might sound at least as smooth as *Pipersmithii, Nationalparkensis* and a few others of equal mellifluousness put over on this side of the world. *Krascheninnikowia Maximowicziana* is a small herb belonging to the pink family and by many is known simply as *Stellaria bulbosa.* A Russian named Turczinow made the diabolical genus name under which the plant is now placed, but a Frenchman is responsible for the tongue-tangling specific name. Fortunately for us, the plant is a Japanese species and we may let our little brown brothers worry over the pronunciation of the scientific cognomen. It probably sounds a good deal like it would look printed in Japanese characters.

Books on the Iris.—The publication of the article on the iris in the February number of this magazine has brought out several requests for further information regarding this interesting group of plants. The literature, however, does not seem to be abundant. The matter relating to the irises in gardening books has reference largely to those species that are commonly cultivated and about which the beginner is likely to be already informed. The only book dealing exclusively with irises is Irwin Lynch's admirable "Book of the Iris" which costs a dollar. C. S. Harrison, York, Nebr., has issued a 30-page "Iris Manual" which deals with the cultivation of these plants and though much less extensive than Lynch's volume will be very useful to beginners. It costs 25 cents.

Limiting Factor in Soils.—Only ten chemical elements are said to be indispensable to plants. All the sugars, starches, vegetable oils and wood fibres in the world are made from three of these, namely carbon, hydrogen and oxygen. They are literally "made of wind and water" for the necessary elements are derived from the air and the moisture in the soil. The other elements are needed for building up more complex substances, including protoplasm the living matter of the cell. Some are needed to perfect seeds, others in changing energy into useful work and still others to neutralize harmful acids in the plant. This accounts for the fact that plants that are depended on to supply the substances mentioned above, must have more than the three elements to work with and a single missing element sometimes makes a great difference in the size of the crop. Most soils are easily depleted of several of the chemical elements needed by plants. This is the reason why farmers and gardeners spend so much thought on methods of enriching the soil. Usually the element least abundant is nitrogen but potassium and phosphorus are frequently as scarce. In some experiments made at the University of Illinois it was found that wheat fields yielding only about six bushels of wheat to the acre were short of phosphorus, and when this was applied the yield at once jumped to twenty-three bushels—nearly four times as much. It is thus seen that the absence of a single needed element may have an exceedingly important effect on the crop, and those who own land would do well to ascertain what their fields lack to produce their maximum yield.

Conopholis Americana.—In reference to the distribution of *Conopholis Americana,* squaw-root, mentioned in the August (1912) number of the *American Botanist,* page 77, I can say that in about 30 years of more or less tramping to hunt plants within 100 miles of Port Huron, St. Clair County, Michigan, I saw it but once—in shade near an old pine stump—until 1908 when it was noticed in abundance on Stony Island in Saginaw Bay, a part of Huron county, Michigan. There it was in thick woods of beech, maple, elm and ash.—*C. K. Dodge, Port Huron, Mich.*

Conopholis is certainly rare in Rhode Island. In my fifty odd years herborizing, I never saw it within our state limits. Here (Touisset, Mass.), it was found last year and this, in the same spot in a mixed wood of beeches, ironwood, oaks and ash, in a soft mush of old leaves. *Aphyllon uniflorum* is common both sides of the line, which is half a mile from my house. —*Dr. W. W. Bailey.*

Color Changes in Rudbeckia.—The common black-eyed Susan (*Rudbeckia hirta*) is greatly prone to vary. At a recent meeting of the American Association for the Advancement of Science, Dr. W. J. Beal exhibited a dozen or more striking variations in the flowers which he had selected from wild plants of this species and no doubt any student with access to a considerable number of these plants in flower could do as well. One of the variations most frequently found is that in which the normally yellow rays are marked near their bases with a band of brown. Occasionally this circle of brown extends to or beyond the middle of the rays, after the manner of the flower heads in the nearly allied *Rudbeckia speciosa bicolor.* The brown in the rays of *R. hirta,* however, does not seem to be very firmly fixed, for upon transplanting such specimens to the garden they frequently, if not always, return to the normal color. Specimens transplanted by the writer of these lines acted thus, and the same thing was recently reported in *Rhodora.* The writer, however, was able to secure considerable seed from the abnormal specimens and now has a hundred or more plants from the seed, which will be watched at the blooming season next year, in expectation of seeing the brown color reappear.

The Scientist and the Novice.—In an experience of some twenty-two years of editing scientific magazines, I have been more and more impressed by the fact that the greater the man the more willing he is to help those who are not so great. I have found that when I want to know the answer to even the simplest question it is best to send that question to the biggest expert in that particular line of thought that there is in the country, or perhaps in the world. Then I am sure to get not only an authoritative but a kindly and prompt answer. Several times I have thought when a question comes to my desk, one, for example, pertaining to dentistry, that I would send it to a local dentist, or a legal query to a local lawyer, or perhaps some point of natural science to a local teacher who should have access to many books. But such an action almost invariably proves to be a mistake. Several times has come the reply, "I am too busy in my work to answer your questions," and not infrequently "This question is too simple for me to take time to answer. You ought to send it to someone more interested in elementary work than I am." But not once in almost a quarter of a century of experience have I been refused, or repulsed, or delayed by any really great authority. I now send such questions, simple as they are, to the most learned men and women in the land or to the most accomplished specialists. Surely the missionary spirit goes with greatness and accompanies profound learning. The well informed man is sure and speaks accordingly. The man who refers me to an elementary text-book has himself need of further information.—*Edward F. Bigelow in Guide to Nature.*

STRUCTURE OF THE FRUIT.—A fruit, regarded structurally, is the part of the flower that persists after pollination has been effected, that is to say, after the possible seeds have become real seeds. In most cases the fruit may be described as the ripe seed-boxes, or as a collection of ripe seed-boxes, with or without extra parts such as the fleshy top of the flowerstalk or a persistent calyx. In many cases, as in common cereals where a single seed fills the seed-box, fruit and seeds are practically identical, though the theoretical difference remains clear. In order to understand the different kinds of fruits, which represent solutions of a very difficult problem, we must also notice that the wall of the fruit (the pericarp) often consists of several layers very different from one another. Thus in the familiar case of the plum there is the firm outside skin (epicarp) which keeps bacteria and moulds out until it gets even a slight wound; there is the fleshy pulp (mesocarp), which is all loss to the parent plant, but attracts the birds which scatter the seeds; and there is the very hard "stone" (endocarp), which effectively preserves the seed within—a living embryo—from being digested in the bird's food canal, from being frostbitten in the ground, from premature germination and from other risks.—*From Thomson's "Biology of the Seasons."*

LATE BLOOMING LUPINE.—It is interesting to record the fact that the common Lupine *(Lupinus perennis)* of the dune region of northern Indiana, like some of our violets, occasionally blossoms in the fall. On September 1, 1912, I found a specimen in bloom near Hammond, Indiana. Whether the plant was blooming for the second time or had just come into flower for the first, I was unable to ascertain. This particular specimen is also interesting on account of abnormalities in the inflorescence. At the top of the exceptionally long raceme, there were three buds and one flower and at the base, three pods about half mature. Between these two extremes a distance of 15 cm., there were neither flowers nor pods, nor had any fallen off.—*Edwin D. Hull, Chicago.*

THE LARGEST CHRYSANTHEMUM.—In view of the rapid progress that plant breeders are making in increasing the size of flowers and fruits, it would be difficult to set a limit beyond which we were willing to certify that a given species could not go. Of course, the greatest improvement has been made in common vegetables and the flowers usually kept in stock by the florist but in none is the increase more marvelous than in the chrysanthemum. Everyone is familiar with those large globular flower-heads made by removing all the flower buds but the terminal one and throwing all the strength of the plant into this, but it may surprise some to learn just how large the largest of these may become. According to *Horticulture,* a French amateur recently won a prize of twenty dollars with a chrysanthemum that measured more than sixty-four inches around it. This is many times the size of the original flower-head and suggests great possibilities when the same methods come to be applied to tomatoes, cherries, and the like.

LINEAGE OF WALNUT AND HICKORY.—The walnuts and hickories are characteristic members of the tree flora in North Temperate latitudes and, though they are usually regarded as rather primitive types, they have held their own against various newcomers for a very long time; in fact, the family line is supposed to go back some millions of years and evidence of it has been found in the mid-cretaceous. Several of our well-known species have also been found fossil, among them the pecan, the shagbark, the bitter nut and the water hickory. In earlier days the hickories were much more widely distributed than at present and were found throughout central and northern Europe and even extended to Greenland and Spitzbergen. There are now no members of this group indigenous to Europe and it is believed that all the European species perished during the ice age. The walnuts, which are own cousins to the hickories, were spread even farther, and extended from Alaska across North America, Europe and Asia to Japan. This group was more fortunate than the hickories and many escaped extermination during the glacial period. Today representatives are still found in Japan and the Mediterranean region as well as in America. The walnuts and hickories seem never to have spread very far into the tropics but the Juglandaceae, the family to which they belong, is represented there by several small genera. In prehistoric times these spread north with their allies even to Greenland but at present they are decidedly tropical. Curiously enough, these tropical species lack the very characteristic fruits of our species. Instead of hard-shelled nuts, they have light winged fruits modified for distribution by the wind. The tropical Juglandaceae belong to the genera *Pterocarya, Platycarpa, Engelhardtia* and *Oreomunna.*

EDITORIAL

We are often adjured by sentimentalists to "love the lily and leave it on its stalk" but it is hard to make such an idea go down with the urchin who reasons that to leave the flower on its stalk is only to provide temptation for some other individual and it therefore becomes his duty to remove both flower and temptation at once. Everywhere in the vicinity of cities, the showy wildflowers are sure to be harvested and the unselfish individual who refrains from picking them may possibly be buoyed up by the thought that by so doing he has given somebody else the pleasure he might have had, but such thoughts are not likely to bring much comfort to the average flower gatherer. The stubborn fact which is bound to obtrude itself into any discussion of this subject is that so long as there is no law expressly prohibiting the picking of flowers, it does little good for a few people to agree not to pick them. Instead, therefore, of teaching children not to pick flowers at all, it would be far better to emphasize the fact that a bouquet cannot be valued merely by its size, that a few flowers in a vase look better than a large number and that a judicious selection of the best blooms indicates taste and judgment and results in a bouquet that will long outlast one picked without discrimination. If children could be taught to select flowers with care they would leave those that were past their prime and in consequence a much larger number would be left to go to seed. One of the chief dangers that threaten the wildflowers is due to the idea that if a few flowers are good a larger number must be better. Adults as well as children often pick more flowers than they can use because they wish to see how many they can get. It is counted some sort of misdemeanor to find a patch of flowers and not take all that are in bloom. If the flower protectionists really wish to save the wildflowers let them discourage such indiscriminate picking.

* * *

It was our intention to end the 75 cent subscription rate with the February number, but owing to the fact that the edition was exhausted before we had covered the territory we had planned to cover, we have decided to extend the offer to July 1st. We have printed an increased number of this issue which we shall mail to former subscribers of this magazine and the *Fern Bulletin*. If this paragraph is marked it is an indication that we will send the magazine one year, beginning with the next number, for 75 cents. This will also entitle the subscriber to renew at this rate as long as he cares to do so. Now is the time to subscribe!

* * *

When we sent the February number of this magazine to press we had a suspicion that it was a pretty good number and accordingly ordered an edition one-third larger than usual, but before the middle of March the supply of samples was exhausted and we have been obliged to hold all subsequent applications for the present number. We regret that we were unable to supply all but we trust that this number will be as satisfactory. We can still begin a few subscriptions with the February number but those who wish to begin then should lose no time in ordering.

* * *

Since a large number of subscriptions to the *American Botanist* end with this number, we again call attention to our list of permanent subscribers. The permanent subscribers are those among our friends who have more than a passing interest in the magazine and who do not regard subscribing to it as an annual affair. They order the magazine sent until ordered stopped and pay for it each year when most convenient. Moreover, as befits those who are the special supporters of the magazine, they pay less than the rate for transient subscriptions. Our rate to permanent subscribers is 75 cents a year. Any subscriber to this magazine may become a permanent subscriber by requesting us to place his name on that list. No subscriber is transferred without express orders to that effect, but we earnestly request others to transfer. A blank form for the purpose will be found in this issue.

BOOKS AND WRITERS

The teaching of agriculture in secondary schools is spreading rapidly and it is evident that the book makers do not intend that teachers shall neglect the subject for want of a sufficient number of volumes from which to select. One of the latest to appear is Milo N. Wood's "School Agriculture," a book of over 300 pages which discusses both the cultivation of the soil and the breeding of animals. The beginning chapters are devoted to the formation, constituents and classes of soils and are followed by chapters on planting, pruning, propagating and kindred matters. The book ends with a discussion of stock and farm implements. Each of the thirty-nine chapters ends with directions for practical experiments which cannot fail to be of much value to both pupil and teacher. There are also upwards of 200 illustrations, some of which are in color. The book is issued by the Orange Judd Co., New York, at 90 cents net.

According to the title page, "Applied Biology" by M. A. and A. N. Bigelow is an elementary textbook in biology, though a glance through its pages shows it to be the old combination of botany, zoology and human physiology bound in a single cover. The reviewer fails to see how botany in juxtaposition to zoology becomes biology and is inclined to consider the association a mere mechanical mixture and not a chemical combination. As a source of much light upon biological problems, however, the book is bound to be of great value. The authors have a clear and original style that is sure to attract the pupil and have included in the text much information relating to animals and plants that other authors have overlooked. The book is especially full regarding the economic relations of the forms discussed and ought to prove of interest to the general reader. It contains 275 pages and is published by the Macmillan Co., New York, at $1.40 net.

The scientific names of plants, terrifying though they may be to the uninitiated, are seldom regarded with much awe even by the beginner, though he may possibly wonder what they are all about. As his studies progress, he eventually recognizes the meanings of the commoner terms, but it is only the unusual student that ever masters all the technical terms applied to plants. Those who have not the time to trace out the meanings of the terms in Latin and Greek dictionaries, will welcome a new "Dictionary of Botanical Terms" compiled by George Frederick Zimmer and issued by E. P. Dutton & Co., New York. In this little book are some seven thousand names applied to plants with their meanings translated. In endeavoring to make a book that even the beginner may understand, the author has frequently given rather free translations, which in some cases seem to be a bit wide of the mark, but if they do not exactly define, they are not likely to confuse, and all who delight to delve into the meaning of plant names will find this an interesting aid. The price is $1.00 net.

Ever since man ceased to be a savage, he has mixed with his food a considerable number of plants that in themselves have little food value, but which have been regarded highly for the flavor and added palatableness which they give to more important foods. An account of these plants has recently appeared in book form under the title of "Culinary Herbs" by M. G. Kains, Associate Editor of the *American Agriculturist.*

The bulk of the book is made up of descriptions of the plants, their uses and the methods of cultivating and preparing them, but this is preceded by fifty pages devoted to general matters pertaining to the group as a whole. The author is inclined to agree with the French who say that the Americans are "people of one sauce." It is probably true that we use fewer plants for flavoring than Old World people. The average housewife's knowledge of such things seldom extends far beyond sage, parsley, summer savory, and mint, though the author shows that there are many more as easily obtained that are capable of giving entirely new flavors to our food, especially to cheap cuts and left-overs. The book has numerous illustrations and is written in a bright and lively style that ought to do much toward popularizing the plants described. It is published by the Orange Judd Co., New York. Price 75 cents net.

Except for the fact that George W. Hunter's "Essentials of Biology" is not really a volume on biology but is instead three volumes on botany, zoology, and human physiology bound in one, very little fault can be found with it by those who like that kind of a book. Botany comes first in the arrangement with the time-honored sequence of topics reversed to the extent that flowers, fruits, and seeds come before a study of leaves, stems, and roots. Then follow chapters on morphology and ecology after which zoology and physiology are taken up. The book is apparently intended as a source of material for recitations though the topics are presented as a series of problems which the student is supposed to investigate in the laboratory before discussing in the class-room. The book is well written and profusely illustrated and ought to serve the purposes of schools in which the two branches of biology are not recognized as separate sciences. It is published by the American Book Co. at $1.25.

Vol. 19. No. 3 Whole Number 98

THE AMERICAN BOTANIST

AUGUST, 1913

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25 Cents a Copy; $1.00 a Year

WILLARD N. CLUTE & CO.
JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

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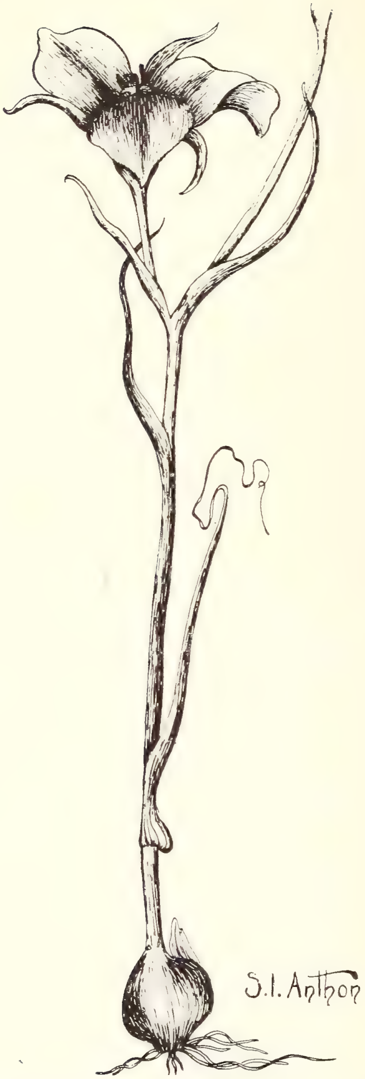


S. I. Anthon

The Surprise Lily—*Calochortus Macrocarpus.*

THE AMERICAN BOTANIST

VOL. XIX JOLIET, ILL., AUGUST, 1913 No. 3

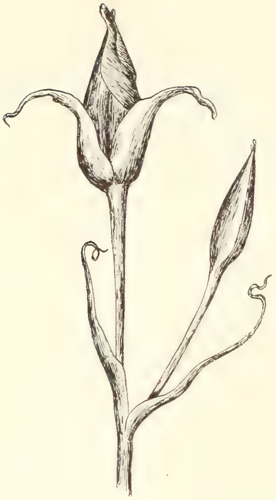
And nearer to the river's trembling edge
There grew broad flag flowers, purple prankt with white,
And starry riverbuds among the sedge,
And floating water lilies, broad and bright,
Which lit the oak that overhung the hedge
With moonlit beams of their own light;
And bullrushes and reeds of such deep green
As soothed the dazzled eye with somber sheen.

—Shelley.

THE SURPRISE LILY

By S. I. Anthon.

A STRANGER coming in sight of our western sagebrush plains is at once startled and dismayed by the dreary expanse of the dull-colored dusty sagebrush which, gnarled and twisted by its ceaseless conflict with the elements, looks as though it were as old as the universe. But on closer acquaintance one learns to like the sagebrush and to go through it with an exhilarating feeling that any new botanical discovery is possible in that enchanted region. For the dreary waste conceals myriads of beautiful and interesting flowers, flowers altogether different from those of other regions and so dainty that it seems impossible that they could come from so unpromising a soil. Among these are the nodding mission-bells (*Fritellaria pudica*), the rock-violet (*V. trinervata*), the sage-pink (*Phlox longifolia*), and the gay crimson and orange cacti. But perhaps the most interesting of all is the



Bud of Surprise Lily.

one the children know as the surprise lily (*Calochortus macrocarpus*).

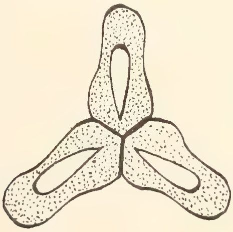
The flower is well named, for no matter how thoroughly convinced you may be that it is concealed in a particular sweep of sagebrush, when you come across it you are startled anew by its gentle dignity and poise. Most of our sagebrush flowers bloom in the early spring; this one waits until late May or June when all other flowers have been literally scorched away and the ground is baked hard. The surprise lily is then at its best, and one may gather great armfuls of the beautiful lavender flower.

The flower belongs to the same group as the mariposa lily, and the group has been particularly well named *Calochortus.* The word comes from the Greek words *kalos* and *chortos,* meaning beautiful grass. The group was so called because the leaves are always reed-like and when it is in bloom it is indeed a beautiful grass-like plant. The species name, of course, comes from the fact that the seed carpels are unusually large, frequently being over three inches long.

The flower was first collected by Douglas, the Scotch botanist, who was sent out by the London Horticultural Society. In his first journey in 1825 he explored much of Washington, Oregon, and Idaho. He found the surprise lily, as he says, "on the dry barren grounds around the Great Falls of the Columbia and on the summit of the low hills between them and the Grand Rapids." It is coextensive with the sagebrush, which corresponds agriculturally with the region where the growing of peaches and watermelons is practicable.

The plant is a perennial, with large coated bulbs which are usually sunk about six inches below the surface of the ground. The leaves are linear-lanceolate, varying in number but clasping the stem and drying up soon. The sepals, three in number, are lanceolate; at first greenish but later fading to lavender about the edges. The petals vary in color, usually being a delicate lavender but one may sometimes find flowers of a clear pink. The petals are much wider than the sepals and are curiously marked by a triangular glandular pit near the base. They are also hairy part way. There are six stamens and a three-angled ovary. The fruit is septicidal, containing numerous seeds which partly explains the many plants one sees in the barren grounds of the northwest. It also spreads by means of a bulblet situated on the stem, generally a few inches below the surface of the ground.

The roots penetrate far into the soil in search of the precious water. You frequently find the flower itself reaching up through a gnarled mass of sagebrush, but in average height it seldom ranges over two feet. It seems to have a conscious pride in its unique position and holds itself proudly erect. It is unusually pretty and deserves a place in our gardens among the later spring bulbs, as each flower measures nearly two inches across and there are sometimes as many as six on a stem. A cluster of surprise lilies in a rockery would be worth traveling far to see.



PENTSTEMON GRANDIFLORUS

By H. Tullsen.

IN southwestern South Dakota the large-flowered beard-tongue *(Pentstemon grandiflorus)* blooms for a short time in spring and early summer. There are several other species of *Pentstemon* that are in flower at this time, but, as the name would suggest, *grandiflorus* is the most conspicuous of all, though, in my opinion, hardly the most attractive. On the Pine Ridge Indian Reservation, a tract 100 by 60 miles in area, I saw this species along but one creek valley, Medicine Root, though P. A. Rydberg found it at Hermosa, in the Black Hills region. Where I observed it, it was growing in the Rosebud silt loam, a calcareous soil. Unlike most of the other *Pentstemons* found in that district, it cannot withstand the dry winds of the upland plains and hills, and occurs in patches, which are, as a rule, protected from rough weather by thickets and banks. The species does not flourish among the trees, however. No doubt, the moister prairies of the upper Mississippi suit it very well. Its restricted distribution where I found it is very likely due to its adaptation to sheltered and well-watered spots. Rydberg mentions it as one of the plants that have migrated up the streams of the Black Hills country.

My notes, made several years ago, contain no allusion to its odor and my recollection is that there is none that is noticeable. The color of the corolla is lavender-blue. The plant has very much the aspect of a cultivated form, with its large, showy flowers and its thickish, cordate-clasping leaves. In the locality where I found its colonies, no other plant appeared to dispute its occupancy of the ground. Wild roses of more than one species are in bloom at the same time with our *Pentstemon,* and one kind is shown in the picture.

Among the contemporaries of *Pentstemon* are *Ribes aureum* and *R. floridum,* which grows close to the water's edge, while *Erysimum* conceals, with abundant yellow, the old field-sites that the Indians have given back to Nature. On the heights at this time are blooming the red false-mallow (*Malvastrum coccineum), Calochortus,* milk-vetches *(Astragalus), Psoralea,* and numberless others.

"The beautiful is as useful as the useful," and the one use which I have known this *Pentstemon* to subserve is shown in the illustration.

THE DAY LILIES

By Willard N. Clute.

IT is rare that every species in a genus possesses sufficient beauty to merit a place in the flower garden, but in the case of the plants belonging to the genus *Hemerocallis* there can be no mistake about it. There are only about half a dozen species in the group, to be sure, but all have handsome flowers and attractive foliage that make them equal in beauty to the true lilies, though they lack the range of color in these latter plants. They have, however, a hardiness of constitution and an adaptability of character that should go a long way toward making them prime favorites with all who cultivate flowers.

Though the flowers are shaped like lilies, they are not true lilies, according to the botanist, for they grow from rootstocks with numerous thickened roots, instead of from bulbs as the true lilies do. The generic name, *Hemerocallis,* keeps on the safe side by meaning merely day beauty or beautiful by day, which the flowers certainly are, and some species are beautiful by night as well. Nor must our plants be confused with another group of so-called day lilies with broad rounded leaves. The latter are more properly called plantain lilies and belong to the genus *Funkia.* The true day lilies have narrow grasslike leaves quite different from those of related plants.

The day lilies are all natives of the Old World. The center of distribution is in eastern Asia from whence one or two species have worked into northern Europe. The majority, however, are found in Japan. The commonest species in America is the tawny day lily (*Hemerocallis fulva*). It is frequently found in cultivation but more often may be seen along roadsides in the vicinity of old gardens from which it has either escaped or been ejected. It is extremely hardy and persists in spite of the native vegetation, even making headway against it and spreading into nearby fields. It appears to have been a favorite plant with the early settlers and is often found marking the site of some ancient dwelling long after the house has crumbled into ruins and the gardens and lawns have been overrun by wild nature. It is likely that its very thriftiness has been its own undoing in the garden for it sometimes is a bit more common and vigorous than is desir-

All have handsome flowers and attractive foliage.

able for the good of the other plants. Like many another it has not learned of the sin of being common. This plant is often miscalled tiger lily, though it has not much resemblance to the real tiger lily, the latter having upright leafy stems with black bulblets in the leaf axils. A double variety of our plant is know as the variety *Kwanso* and the plant itself is sometimes sent out under the name of *Hemerocallis distichum.*

The flowers are large and produced in abundance.

Though the very commonness of the tawny day lily operates to make it less desirable in the flower garden than any of its allies, it is still worthy of a place in some out of the way corner if only for the cheerful way in which it accepts any conditions of life that may be imposed upon it. Its flowers are scarcely as pleasing as are those of other members of the group, being of the color usually described as brick red, but they are large and produced in abundance at a time of the year when large flowers of any kind are scarce—points in its favor which are not to be ignored when planning the flower garden.

The day lilies, however, should not be judged by their tawny-flowered congener. All the others are regarded as being much handsomer, though in most cases the flowers are somewhat smaller. One of the finest is the copper lily (*H. Dumortierii*) which is first to bloom in spring and has fragrant flowers of a clear, deep, coppery yellow. The earliest flowers appear late in May and new ones continue to appear during most of June. This plant is frequently offered by dealers under the names of *H. rutilans* and *H. Sieboldii* and the novice should keep this in mind to avoid duplication in his buying. The pale copper lily (*H. Middendorfii*) should not be confused with this species. It blooms about the same time and might, at first glance, be taken for a paler variety of it though the whole plant, and especially the flowers, are larger. The underground parts, however, may be relied on to distinguish it. In the copper lily some of the roots become thickened and tuberlike, but in *Middendorfii* they do not. Both these plants are very desirable for the garden.

There are three species in this group that are called lemon lilies. The one to which the title seems rightfully to belong, *Hemerocallis flava,* is the earliest to bloom, its first flowers appearing soon after those of the copper lily have opened. It is the species oftenest seen in gardens and has flowers of medium size and clear lemon yellow in color. The late lemon lily (*H. Thunbergii*) would be easily mistaken for it if its blossoms appeared at the same time, but they rarely open until after the last of the lemon lily's bells have closed. The first ones appear early in July and the plant remains in bloom throughout the month. It is considerably taller than the lemon lily and has the peculiar habit, for a day lily, of first opening its flowers in the early evening. The flowers are slightly fragrant. The lesser lemon lily (*H. minor*) is seldom seen in cultivation though, since it is a native of Siberia, it should prove hardy in most parts of the United States. Its name of lesser lemon lily refers more particularly to the leaves, which are quite slender and grasslike. This also accounts for its frequently being listed as *Hemerocallis graminifolia* and *H. graminea.* The flowers are pale yellow. In recent catalogues still another species is listed as *H. citrina.* This is said to come from China and to have pale sulphur-yellow flowers which are fragrant with the odor of citron. It blooms in July. Its introduction is so recent that very little seems to be known about it.

The last of the genus is the orange day lily (*H. aurantiacum*) which blooms in July and August. Its flowers are a pleasing shade of deep orange-yellow and are delightfully fragrant. It is reputed to be not quite hardy in some parts of our country but a longer trial is needed to settle this point. It has a variety, *major,* which is larger in every way than the type, and several hybrids between this and other species are known, most of them said to be hardier than the type.

The day lilies are rather fond of the sunlight if the soil is moist but they are generally a rugged lot and thrive in almost any soil. In deep shade they do not produce as many flowers as they otherwise would. The taller species are valued for planting on the borders of ponds and water gardens. Most nurserymen can supply the different species, the price being about fifteen cents each. Those who have not made the acquaintance of the rarer species have a treat still in store for them.

PLANTS OF THE SOUTH DAKOTA SAND HILLS

BY PROF. S. S. VISHER.

VERY few realize that the Nebraska sandhill formation reaches into the Pine Ridge Reservation of south-central South Dakota. Since no botanist had collected in the South Dakota sandhills it was believed that a considerable number of species could be added to the flora of the State by a study of that region and in consequence I visited the area for the State Geological and Biological Survey in August, 1911, and added about fifty species to the State flora.

Sandhills as seen from the distance are not inviting; they appear as a low line of similar yellow hills, or, if one can look down from a divide, as we first did, a complex of irregularly arranged dunes with here and there the glimmer of a tiny pond. The brightness of a patch of freshly exposed sand, or the darkness of a marsh filled with vegetation alone break the monotonous drab of sand and shrub. As the hills are approached small "ranches" are noticed just this side of the line of frontier dunes and cattle may be seen wandering about nearby.

It is only when one gets within the dune district, and sees the variety of the vegetation that the reason for the reputation that sandhill districts have among botanists and picnickers becomes evident. One quickly notes the striking difference between the almost level, dry clay plains covered with its carpet of short "buffalo grass" and the rough sandhills with their tall clumps of "bunch grass," many fruiting shrubs and narrow valleys filled with dense thickets through which ripple clear, cold brooks. Though the sand is fertile, fields are likely to drift badly. Pastures are in ill repute, because of their tendency to blow; and while small meadows occur, the roads are so heavy that it does not pay to haul hay far. Perhaps it is the impression of irredeemable wildness that gives the sandhills part of their attractiveness.

The many differences between the adjacent grassy plains and the sandhills seem to be entirely due to the sand. In elevation there is no notable difference; it is not likely that there is any more precipitation; it is readily apparent that the sandhills in general are no cooler. If this area receives no more rainfall, and is not cooler whence come the increased vegetation, the bountiful springs and the fresh ponds?

The sand, being loose and porous, absorbs at once all rainfall. Even during a heavy shower no water runs off on the surface. For a short time after rain the evaporation is very rapid, more rapid than water can be supplied from below by capillary action. Consequently the capillary tubes become broken and evaporation stops long before any considerable amount of the recent precipitation has disappeared. The balance escapes slowly from the leaves of the vegetation and from the many voluminous springs which supply the brooks that drain the region.

As might be expected the air temperatures become very high especially in the blowouts during sunny days. This superheated air rises to join the general wind and as a result the winds blowing across the sandhills are exceedingly drying and the vegetation must either because of an abundant supply of available moisture, be able to endure rapid evaporation or it must be able to resist drying by possessing restrictions against evaporation. Both types are found. The bunch grass, roses, bush morning glory, sunflower, and thistle are examples of the former; the cacti, sand cherry, yucca and prairie pink are examples of the latter. A number of the characteristic plants have much longer tap roots than do even nearly related species which are to be found in the harder subsoil of the steppe; a few including the cacti, bush morning glory and psoralia have organs for storage.

If it were not for the permanent streams with their fringe of marsh-loving herbs and of chokecherry, plums, buffalo berry and Juneberry bushes, all more or less overrun with wild grape vines, the sandhills would not be so popular; though on account of the large, juicy (even if somewhat bitter) sand-cherries alone they would be visited by the Indians and settlers. The chokecherries are the largest and most desirable of all that I have ever seen. In some seasons the raspberries too are plentiful.

The predominant species are perhaps the following: The bunch grass (*Andropogon scoparius*) is dominant. The sand grass (*Calomovilfa longifolia*) and the spear or needle grass (*Stipa comata*) are common. *Andropogon Hallii* is occasionally abundant on the upper slopes and the tops of the ridges. Grasses growing between the bunch grasses are hair grass (*Erogrostis trichodes*), Indian millet (*Oryzopsis cuspidata*), Black Grama (*Bouteloua hirsuta*) and the sand-burr grasses (*Cenchrus tribuloides* and *C. carolinianus*). The shrubs of the sandhills are Sand-cherry (*Prunus Besseyi*), Chokecherry (*Prunus melanocarpa*), the plum (*Prunus americana*), Spanish bayonets (*Yucca glauca*), bush morning-glory (*Ipomoea leptophylla*), poison ivy (*Rhus Rydbergii*), Dogwood (*Cornus stolonifera riparia*), prairie willow (*Salix humilis*), lead plant (*Amorpha canescens*), buffaloberry (*Lepargyraea argentea*), wild rose (*Rosa Arkansana* and *suffulta*). The most common trees are the hackberry (*Celtis Americana*), elm (*Ulnus fulva*) and the cottonwood (*Populus Sargentii*) and even these are few and small.

The most conspicuous of the herbs are perhaps the annual eriogonum, the Prickly Poppy (*Argemone intermedia*), the sand spurge (*Croton Texenis*), the showy gilia (*Gilia longiflora*), the green milk-weed, three members of the Caper family, (*Cleome serrulata, Cristatella Jamesii,* and *Polanisia trachysperma*). Legumes are frequent; *Lupinus pusillus, Petalostemon villosa* and the narrow leaved *Psoraleas* are perhaps the most numerous. The two most general composites are the wormwood (*Artemisia dracunculoides*) and the viscid aster (*Machaeranthera sessiliflora*). In the shade of the willow thickets are to be found a number of additional herbs among which may be mentioned the western night-shade (*Solanum interior*), wallflower (*Erysimum cheiranthoides*) and *Allionia nyctaginea.* The borders of the brooks are quite gay with flowers. Among the brightest are the monkey flower (*Minulus Geyeri*), Thoroughwort (*Eupatorum Bruneri*), St. John's wort (*Hypericum majus*), the willow herbs (*Epilobium lineare* and *E. adenocaulon*), the touch-me-not (*Impatiens biflora*), the Marsh-elder (*Iva axillaris*), the bur-marigolds (*Bidens glaucescens* and *B. tricopermum tenuilobata*) and perhaps the gayest of all *Gerardia paupercula.*

THE MOONWORT

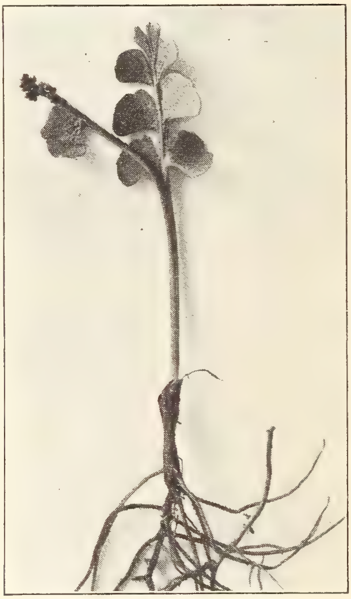
By Adella Prescott.

IT is one of the delightful things about going a-ferning that while you may fail to find the special thing you are looking for, you often find something better. It was when I was looking for the adder's-tongue that I found the moonwort. I was visiting in the northern part of Oneida County, N. Y., late in June, and the young son of my hostess was anxious to have me visit a nearby ravine where he said "all kinds" of ferns grew. From his description I anticipated finding only the common ferns and we did find them in wonderful luxuriance and great variety—many of the wood ferns, all of the osmundas, the tall spleenworts, dicksonia and others, but it was when crossing the mossy old pasture at one side of the ravine that I made my great discovery, a discovery that seemed to my youthful guide quite out of proportion to the excitement it produced, for even the most enthusiastic botanist would hardly call the moonwort beautiful.

The field seemed to me a likely place to look for the adder's-tongue and, stooping to scan the ground more carefully, lo, at my very feet, was a tiny moonwort. It was very small and somewhat imperfect owing to late and heavy frosts, but I had read its description and studied its outlines too often to be deceived and a further search disclosed several more. Most of them were very small and few were perfect, but a few were five or six inches in height with a well developed fertile division, some of them having a few sori on the sterile division as well.

The moonwort (*Botrychium lunaria*) is a northern species and is not found south of New York and Connecticut.

Even Gray pronounces it "rare," so a novice who was "just scraping an acquaintance with nature" might surely be excused for displaying considerable enthusiasm even if the plant itself is not very attractive to the unknowing eye. Like other *Botrychiums*, it bears but one frond annually, divided after the fashion of its kind into a fertile and sterile portion. It is so fat that, like other grape ferns, it makes no attempt to coil after the characteristic manner of fern crosiers, merely bending its head a little as a concession to the custom of the family. The blade is borne near the middle of the stem and is usually pinnate having from two to eight pairs of fan-shaped pinnae suggesting in shape the half moon. The fertile division is about the same length as the sterile and twice or thrice pinnate. As in other grape ferns, the bud for next year is enclosed in the base of the stipe.



A moonwort with fertile and sterile pinnae mixed.

This plant is found in many parts of the world and is considered "local rather than rare" in England. In the Old World it was supposed to have magic power and to work many wonders, such as drawing the nails from the shoes of the newly-shod steed, the loosing of fetters, locks, etc., but an old writer says, "It is all but false suggestion and meere lyes," an opinion in which I heartily concur.

OUR NATIVE AQUILEGIA

By Bessie L. Putnam.

WHILE the mammoth yellow columbine of the Rockies commands the attention from florists which its stately form deserves, its more humble yet equally deserving cousin of our Eastern hillsides, *Aquilegia Canadensis,* is likely to become extinct locally from its native slopes without being given the right to existence in the well regulated garden.

In form and outline it is infinitely more graceful than most of the exotic varieties, the slender stems and airy form being especially pleasing. The colors, blending from a coral red to a honey yellow in the same blossom, are a unique combination as unusual in the floral world as it is charming. The plant is usually in bloom for Memorial Day, a fact which commends it to all who are interested in the observation of this day.

It is hardy, easily grown from seed or by transplanting, and it may even be transplanted when in bloom without detriment to the plant. While its natural habitat is the hilly wayside, it readily adapts itself to ordinary garden culture in either sun or shade, easily maintaining its own through root growth, and furnishing enough seed each year to allow as great an increase as is desired. Those growing the garden columbines will find this, the only native *Aquilegia* east of the Mississippi, a most charming addition to the collection; while as a feature in our wooded parks, its value should not be overlooked.

TRANSIENT BOTANIZING

By Dr. W. W. Bailey.

ONE may sometimes do some pleasant botanizing from the windows of a railway car. It is my belief, however, that some inexorable fate compels the train to hurry just at those points where the observer's curiosity is heightened by the sight of some conspicuous flower, ill-determined by the rapid passage. Often have I longed for even a five minutes stop to allow me to ascertain what orchid, perhaps, was offering its splendid tribute for admiration.

For several summers I have been impressed by the Weehawken meadows, gay with flowers as the fabled fields of Enna. The West Shore Railway carries one through these and he has views of the long acres of purple loosestrife (*Lythrum salicaria*). This becomes still more abundant in Rockland and Orange counties, New York. The splendid carpet of lavender is enriched by frequent ravishing glimpses of tufts of rose mallow (*Hibiscus moscheutos*) surely one of the most superb of our native flowers. How cool and inviting are its pavilions of pink, satin-like material into which some troubador bee, gay with black and yellow velvet, plunges for his siesta.

After all, despite our teaching to the contrary, big flowers are most enticing. For instance, in these same swamps one sees great trumpets of pink and white bind weed, or splendid, single white roses. The tiny flecks of flowers in which the microscope reveals many undreampt-of beauties—the grasses like wild rice or the spartinas for instance—are not wanting, but of these the car window only permits of a view *en masse*.

In New England the red cedar or juniper, while always ornamental, has nothing especially striking in its pose or habit. In the Hudson highlands, however, where the trees are known as the sentinel cedars, they assume a tall, spiry, poplar-like aspect very noticeable and picturesque. On the ruins of forts Montgomery, Putnam, Clinton, and other revolutionary remains they stand like sentinels indeed, guarding now only a tradition.

In the highlands one notices all summer long, the great purple-red blossoms of the flowering raspberry with its maple-like leaves. This shrub is well worthy a place in gardens and is, indeed often seen therein. It will be seen from these rambling notes that one knowing Nature, and loving her a little, may pleasantly diversify his time in necessary car travel by observing the various flowers which in gay kaleidoscope whirl by him. Surely there is no reason at any time for the botanist to be bored.

WILD SOAPS

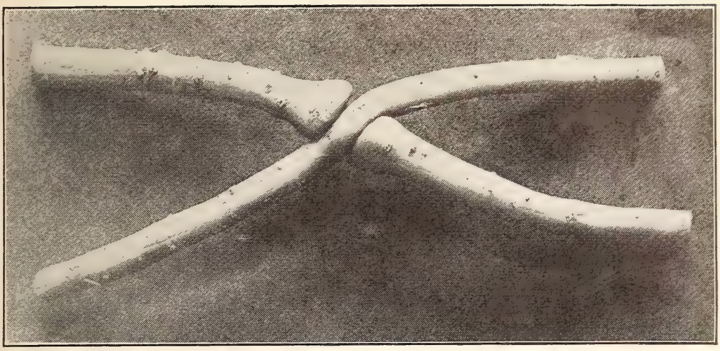
By Charles Francis Saunders.

AMONG the phenomena of American plant life little known to the average person is the formation of a soapy, cleansing lather by some of our native plants when certain of their parts are rubbed in water. Such a characteristic has obvious practical value to one caught on an outing without soap.

All who have roughed it in the great Southwest, are familiar with the amole or soap-root of those arid wastes—the root of a species of yucca, (*Y. baccata*), which, stripped of its bark and pounded, is extensively used in lieu of soap by Mexicans and Indians. Similarly well known to Californians is the bulb of another soap-plant—a rather tall, slender herb of the lily tribe called in botanical parlance *Chlorogalum pomeridianum,* whose small lily bells of bloom gleam like stars in the brown tangle of California waysides in early summer. The white onion-like bulbs wrapped by Mother Nature each in a coarse fibrous coat which slips off easily, may be crushed in the hand and agitated in water, producing a delightful lather which is both pleasant to feel and effective in removing dirt.

Less known as possessing saponaceous qualities but more poetic, are the delicate blossoms of several species of Californian *Ceanothus,* called on the Pacific Coast "wild lilacs." Among my pleasant memories of wayfaring in Southern California is the gathering of handfuls of these blossoms and rubbing them up in some quiet pool of a canyon's rill. After such an ablution the skin is left delightfully soft and clean, and in the case of at least one species, fragrant with a faint perfume as of almonds.

Remembering this property of the Californian *Ceanothi,* I have recently experimented in a similar way with the flowers of our common Eastern species (*C. Americanus*) familiarly called New Jersey tea or redroot. While not so freely productive of lather as their Western cousins, they are yet very satisfactory and impart to the skin for a few moments an agreeable spicy perfume. The best results are obtained by using the blossoms unmixed with leaves or stems. A less desirable lather can be raised from the green seed-vessels. The plant is frequent in clearings and at the edge of dry woods throughout the region east of the Mississippi and flowers abundantly in June and July. Picnickers and campers will do well to bear in mind the useful part it may be made to play in a toilet *al fresco.*



ROOT PUNCTURED BY ROOT

IN the issue of this magazine for November, 1911, we published a note from Professor Charles E. Bessey regarding the puncturing of one root by another, but the question of how such a condition is brought about is still unsolved. The fact that the subterranean runners of the quack grass can penetrate potato tubers and other underground plant parts is well known, but these runners are tipped with sharp points adapted for pushing through the hard earth. With the soft root-tips, it is quite a different matter. However, the fact that roots occasionally do puncture others in this way is shown in the accompanying photograph made from a specimen found by Ray T. Thomson and sent to Professor Bessey in confirmation of his original note. This specimen is now preserved in professor Bessey's office. Regarding the root Mr. Thomson says: "The horse-radish roots were found about August 17, 1909, in Orchard, Nebraska. The plants grew in rows eighteen to twenty inches apart. The two roots, which penetrated one another, grew from plants in opposite rows and at a depth of six to eight inches. The roots were running almost horizontally when they came in contact. The plants grew in a sandy loam soil, which had been well manured. During the summer months, they were watered occasionally and the soil about them loosened, since the ground on which they grew had once been a place for dumping ashes. The plants were not crowded in their growth and the roots did not appear to be cramped for room to spread out."

WHAT BULBS TO PLANT

NOT every person who calls himself a botanist is interested in the cultivated pets of the gardener, but everyone ought to have more than a passing interest in the spring flowering bulbs which hint of the coming of a milder season long before the wild species of field and wood confirm the fact. Still earlier than the flowers comes the bulb catalogue; in fact, if the weather is good it should appear in the early autumn along with the crocuses which, impatient for spring, are so early as to appear late. It is not impatience but necessity, however, that actuates the bulb catalogue, for if spring-flowering bulbs are not planted in autumn there will be no spring flowers. The bulbs of this kind need the autumn and early winter in which to make roots and get things ready for an early start. The old bulb grower needs no instructions regarding the selection of bulbs but the novice may be glad to have a few hints at the beginning. To such it may be said that while all the different kinds of bulbs offered by the dealer will grow and bloom, there are some that are much better for the beginner than others because they yield their flowers with a minimum of attention on the part of the cultivator. The best bulbs to begin with, then, are the tulips and narcissi. Crocuses are cheap and make a fine show against a background of bare earth or withered leaves but they are not available for cutting and are easily run out by stronger plants. Hyacinths are fine when in bloom but they, too, are not very persistent and often fail to bloom properly. The tulip is always on the job. Its large and brilliant flowers light up the grounds as those of no other early flowering bulbs can do, and they serve admirably for bouquets indoors. Tulips may be had in all colors except blue, with flowers either single or double. In general, the single varieties are best and, fortunately, the cheaper sorts are the most easily grown. When one can get fifty tulips for half a dollar there does not seem to be any very good excuse for allowing the borders to go without flowers until the middle of spring. If the plants are set in beds, one may have two entirely different crops of flowers from the same area by sowing the tulip beds, while yet the tulips are blooming, with seeds of petunia, portulaca, poppy or annual phlox, which will give brilliant masses of color all summer. The tulips may be left in the ground after they have died down, and the next spring will come up stronger and brighter than ever. In recent years a new race of late tulips, called Darwin tulips, have come into the market. These have stems a foot or more long with flowers of many delicate shades. They are as easily grown as the commoner sorts, but as yet are rather expensive, some varieties selling for as much as fifteen dollars a hundred. The narcissi are fully equal to tulips as satisfactory garden flowers. They multiply rapidly and a single bulb soon develops into a clump. None of the narcissi are difficult to cultivate, though the single varieties will doubtless give greater satisfaction than the double ones. The poet's narcissus is a favorite with many, and the Emperor and Empress are magnificent varieties. Among smaller bulbs the glory of the snow (*Chionodoxa gigantea*) with fine clusters of lavender-blue flowers is well worth a trial, and a curious little plant from Syria, *Puschkinia libanotica,* with white- and blue-striped flowers, will make an interesting addition to the bulb bed. Any catalogue will list many other kinds of bulbs with which the young gardener can find amusement in experimenting, but the ones here mentioned are least likely to disappoint the beginner without previous experience to guide him. Though the bleeding heart (*Dicentra spectabilis*) is not a bulb, attention may be called to the fact that autumn is the proper time to set specimens of it in some sheltered corner. This plant is a spring blooming species, but its smaller relative, *Dicentra eximia,* will produce its small pink hearts throughout the summer. In planting bulbs, they should be set in a light, well drained soil in a spot where the spring sun will find them. It will be well, also, if they have some protection from the cold north winds of early spring, though this is not a necessity. During the winter the bulb bed should be covered several inches deep with dead leaves, coarse stable manure or other litter and this covering should not be removed in spring until the bulbs insist on pushing up through it.

HOME BULB GROWING.—The term "Holland bulbs" has been so much used that we have almost unconsciously assumed that the Dutch are the only people who know how to grow bulbs, or else that their part of the world is the only one with climate and soil favorable enough to allow such plants to come to their best. At the same time, those who have planted any of a dozen kinds of narcissus have seen them multiply and spread into large clumps. Many of the common bulbous plants appear to be as easily grown in America as anywhere else. Gladioli, tuberoses, narcissi and lily-of-the-valley, at least appear to do well almost anywhere, and we are beginning to find out that other bulbous plants heretofore regarded as more difficult to handle can be successfully produced at home by some slight attention to their wants as regards soil and climate. A promising industry in this line has been begun near Bellingham, Wash., and we are likely soon to grow most of our bulbs in this country.

NOTE *and* COMMENT

Pectins.—Every autumn the "answers to correspondents" editors of the agricultural weeklies are bombarded with letters from anxious housewives all plaintively inquiring "why don't my jelly jell?" For the benefit of others who may be as ignorant of the reason, but not, like the housewife, obliged to confess it, it may be said that whether the fruit juices do or do not become jelly depends upon a curious substance called a pectin, allied to the ordinary carbohydrates such as starch and sugar. Some fruit juices lack pectin and others show the substance only after being boiled, but if the pectin is not present, at all, no jelly need be expected. If one is interested in discovering whether a certain juice contains pectins or not, he may place equal parts of alcohol and the juice to be tested in a receptacle and mix thoroughly. Upon cooling if pectin is present there will be formed a gummy mass which may be collected with a spoon. Even when a fruit juice contains pectin, a good jelly may fail to result through the use of too much sugar. A time honored rule reads "a pint to a pound" but modern jelly makers have discovered that a given amount of pectin can handle only a certain amount of sugar. When too much sugar is added a soft and semi-fluid mass results. Still another ingredient is necessary for the manufacture of good jelly. Everybody knows that half-ripe or under-ripe fruit makes better jelly than that which is dead ripe. This is on account of the acid then present. The pectins are slow to act except in the presence of acids. Hence by the addition of tartaric or citric acid to the juices of fruits lacking in this quality, such as peach, pear and quince, good jelly can be made. One of the astonishing things discovered in reference to this subject is that the inner white pulpy part of orange and lemon peel is rich in pectin. This material may be saved, dried, and the pectin soaked out when wanted for use with fruit juices in which pectin is lacking. Potatoes are also reported as containing much pectin. Though pectin is related to the carbohydrates its exact chemical composition is unknown. It results from the action on pectose by a ferment known as pectase. Pectose seems present in most half-ripe fruits and is ultimately changed to pectin.

A MUCH NAMED ORCHID.—There may be such a thing as being too captious regarding the application of specific and generic names, but at the risk of being so considered, we must insist that the constant changing of names in the interests of priority, or anybody else, seems to us an occupation unworthy of anyone more than seven years old. Take the case of a harmless little orchid which, for want of a stable scientific name, we must refer to by using the common one—the ladies' tresses. Rafinesque, an eccentric physician of St. Louis, seems to have been the first to describe the plant and he called it *Neottia plantaginea.* Twenty-four years later, Torrey thought it should have another name and accordingly called it *Spiranthes plantaginea.* He wrote Rafinesque after it, to be sure, but added his own name, possibly as a guarantee of good faith, but certainly with the effect of making it a personal advertisement, as C. G. Lloyd calls it. Fifty-three years went by before the plant was disturbed again. Then Britton figured that it was time for another change of name and he called it *Gyrostachys Plantagineum.* With Britton's name after it? Oh, of course! Nine years later, House, a young man then just out of college, decided to show the old fellows a thing or two and soon dug up a new name for the plant. This time it became *Ibidium plantagineum* with Britton's name moved off and a House in its place. With this last change some people figured that the plant would now get a rest, but alas, there never was a man so sharp that there could not be one a little bit sharper, and while the new edition of the "Illustrated Flora" was in press, Nieuwland, who does not seem to care whose work he musses up, dug up a still older name and now the plant is *Triorchis Plantaginea* (Raf.) Nwd.—or, that is, it was so named the last time we looked. We wouldn't want to say for certain. Nieuwland is pretty sharp when it comes to Latin names but "There never was a man so sharp," etc., and if anybody wanted to bet that the name would be changed again we would not take him up; besides it is not considered ethical to bet on a sure thing!

MENDEL'S LAW AND WHITE PRIMROSES.—Though the rediscovery of Mendel's law occurred less than fifteen years ago, even the general reader has become familiar with its fundamental features. When we once understand the mechanics of crossing, it seems the most natural thing in the world that the offspring from a cross of two pure-bred parents should have within them the characteristics of both parents, and that when the members of this second generation are bred together, the chances are that the new unions would result practically in one-quarter like one grandparent, one-quarter like the other grandparent and one-half like their hybrid parents. In a few cases parental characteristics seem to blend in their offspring, but in a majority of cases, only one character of each pair of characters appears in the first generation. A plant could not, for instance, be both red and white, though a descendant from red and white ancestors. One character, therefore, appears and we say it is dominant, while the other is latent or recessive. We cannot say that the latter is absent, for it is sure to appear in the next generation. The work of experimenting with animals and plants has only fairly started but many remarkable facts have already been brought to light. One of the most surprising is found in the case of certain white primroses. In these there have been found two strains, one of which is dominant to primroses with colored flowers when the two are bred together, while the other strain is recessive to colored flowers. Though the two strains are indistinguishable to the eye, they can be separated by chemical tests. In all probability much of the phenomena of flower color and its behavior when crossed with other colors will ultimately be found to rest on a chemical basis.

ORGANIC COMPOUNDS IN THE SOIL.—The practice of agriculture has been carried on so long that one might hastily conclude that its principles are well established, but the facts are otherwise. Just at present, agricultural scientists are divided into two hostile camps over the subject of manures. One side holds that the soil is inexhaustible and that the only function of fertilizers is to enable plants to rid themselves of toxic substances in the soil which are largely of their own excretion. The other side insists that soils are easily worn out or depleted of certain elements and that manures are necessary to return these elements to the land. One result of the controversy has been to set a good many chemists to studying the soil more carefully and they are obtaining some very interesting results. One line of work has to do with organic substances in the soil, and of these upwards of twenty have already been isolated. Judging from the names of some of them, the soil is "fearfully and wonderfully made." We expect none but the chemist to understand what they all mean but we give the list for the benefit of the curious: cytosine, xanthine, hypoxanthine, adenine, histidine, argenine, choline, creatinine, hentriacontane, resin, resin acids, resin esters, pentose, pentosan, phytosterol, agrosterol, glycerides, and nucleric, carboxylic, parafinic, lignoceric, agroceric, dihydrosteric and monohydrostearic acids. In view of this list we may be pardoned for thinking that those who claim that there are toxic substances in the soil have a little the best of the argument.

CONOPHOLIS AMERICANA.—Since the publication in this magazine of the notes regarding the distribution of *Conopholis,* we have received excellent specimens of the plant from H. C. Bigelow, New Britain, Connecticut, who collected them at Plainville, Connecticut, where they grew in dry rich woods under chestnut trees. The plant is regarded as rare in the state.

CIRCASSIAN WALNUT.—Many of those who admire the beautiful finish of rooms trimmed in Circassian walnut are doubtless unaware that this is none other than the wood of that tree whose fruit we know as the English walnut. The tree grows naturally from the eastern slopes of the Caucasus to the foothills of the Himalaya mountains in India and Burmah, but has been extensively planted in other parts of the world. Much of the wood used in America comes from the region near the Black Sea. The demand for it is steadily advancing the price and other woods are often substituted for it. Its near relative, the familiar butternut (*Juglans cinera*) has wood that closely resembles it both in grain and color and red gum with a similar grain is also occasionally used.

CHANGEABLE PHLOX.—Some mention has been made in this magazine of a specimen of garden phlox in the editor's grounds which changes color daily. Other specimens have now been produced that change from deep purplish pink at mid-day to violet-blue at dusk. Not all pink phloxes have this habit as anyone may discover by visiting the nearest blooming plants of this color, and those that do have it cannot be distinguished from the others at noon. As evening approaches, however, the pink begins to fade and lavender or lilac takes its place and these colors ultimately give way to a deep blue. This color remains through the night and for some time in the morning. When picked and kept in a poorly lighted room, the blue color persists. From this fact it is easy to see that sunlight in some way affects the color-changes. Whether the changes are due to acids acting on the colors in the plant or whether the changes occur as the result of oxidation processes seems not to be known for certain. That the latter are likely to be concerned in the matter may be assumed from the fact that the changes occur at the time the plants cease photosynthesis for the day and therefore cease giving off oxygen, and occur again when the process is resumed. It is probable that when light returns and the plant resumes the exhalation of oxygen, this gas oxidizes some of the cell sap and the pink color returns. The subject is one that ought to prove of interest to the organic chemist.

Influence of Trees on Rainfall.—There are two ways in which forests may affect the rainfall. It is conceded by everybody that wooded areas lessen the danger from floods by holding back the fallen water and obliging it to flow away gradually, thus keeping the springs full and the streams flowing, even in dry weather, but whether the forests can induce a heavier rainfall in their vicinity has been a point upon which there has been much argument in recent years. Our meteorological experts practically agree that forests have no effect on the amount of the rainfall, but now comes Raphael Zon of the United States Forest Service with the statement that forests not only do affect the rainfall, but that they supply most of the moisture that falls on a large part of the United States, all of which he backs up by rather convincing evidence. His contention, in brief, is that since the rainfall ultimately runs back to the ocean, the ocean must be the original source of supply but that the moisture-laden winds from the ocean cannot carry this moisture to the interior of the continent. Most of the moisture that falls in the Mississippi Valley comes from the Gulf of Mexico or the Atlantic ocean but the winds blowing inland drop this moisture as rain before they have gone far. The rain that falls farther inland is the moisture evaporated from vegetation nearer the coast and this moisture may be precipitated and evaporated again and again before it finally runs down to the sea. The connection of the forests with all this is that forests evaporate more moisture in a given time than any other form of vegetation and even more than will evaporate from a free water surface. The existence of forests in the region near the coast is thus seen to be of the utmost importance to those dwelling much further inland. Residents of the northern states in the Mississippi valley are, therefore, more vitally interested in the preservation of the forests in the Southern States than are the residents of the Southern States themselves.

DISTRIBUTION OE VIOLA PEDATA.—Those who are accustomed to make fine distinctions in plant life regard the widely distributed form of the bird foot violet as a variety, reserving the specific name for a plant much less common and with a restricted distribution. This curious situation, in which a variety is considered to be more widely distributed than the type, is due to the fact that the plant named as the type was discovered and named first. Typical *Viola pedata,* then, is supposed to have the two upper petals deep purple and the three lower ones nearly white, while the variety (*linearilobа*) has all the petals lavender. Until recently the type was supposed to be restricted to the Eastern States but it has now been reported from northern Illinois. It seems that the range may be still further extended, for on a recent excursion of the Joliet Botanical Club into northwestern Indiana, the species was found several times near Liverpool.

BEES AND CORN.—We are taught in ecological works that the inconspicuous flowers, such as those of the grasses, are pollinated by the wind and, by inference at least, that insects do not visit such blossoms. That this inference is not always correct is shown in the case of sweet corn where bees may often be seen gathering pollen from the staminate flowers. Since the pistillate flowers (the "ear," in common parlance) do not offer any inducements to the bees, it is unlikely that they are ever visited and, therefore, the bees are certainly not pollinating agents though the secretion of honey on the corn silk would soon induce them to become such. The visits of the bees to the corn flowers call attention anew to the fact that bees gather pollen as well as nectar. It is likely that a majority of people imagine that bees always visit flowers in quest of nectar, which is far from correct.

Planting Irises.—The time to plant most irises is in late August or early September. The plants at this season are nearly dormant and can be moved with little risk. If moved now, they usually become so well established before cold weather that they will bloom the following spring, while if one waits until spring to move his plants, he usually loses one season's flowers. Dealers list such an immense number of named forms of the German iris that one may easily be confused, but if ordering at random, he will make no mistake in selecting Purple King, Queen of May, Jacquesiana, Honorable, Florentina and Madam Chereau. Still handsomer than the German irises, in fact the handsomest irises in the world that are easily cultivated, are those forms of *Iris pallida* called *Dalmatica* and *speciosa*. The best way to buy irises is to visit a nursery when the plants are in bloom and select the kinds that are most pleasing, but if one failed to do this last spring, his only hope of flowers next year will be to order from the descriptions in the catalogues and to do it now.

Color Correlation in Peaches.—It is coming to be well known that correlations in color are not infrequent in plants. Given a species that produces flowers of more than one color, the grower usually has no difficulty in separating the strong colors from the less pronounced while the plants are still in the seed bed. In the forms with light colored flowers, even the stem and leaves are lighter in color than the others. A similar correlation has recently been found by U. P. Hedrick to exist between the colors of the calyx-cup and the colors of the flesh of peaches and nectarines. In all the varieties examined, those having the interior of the calyx-cup green had white-fleshed fruits and all that had the interior of the calyx-cup orange gave yellow-fleshed fruits. In breeding, the colors are said to work out according to Mendel's law and thus prove to be true unit characters. The discovery of the correlation of color in peaches is likely to prove of value to the breeder and grower of peaches since he can thus discover, some time in advance of fruiting, what color a new variety will have.

Calochortus macrocarpus.—That the beautiful is sometimes useful is exemplified by the surprise lily mentioned on another page in this issue. Its bulb is both edible and palatable, a fact which has long been known to the western Indians. In Mary Elizabeth Parsons' "Wild-flowers of California" we find the following: "Among the Indians of their native region the rather large bulbs of these plants are known as 'noonas' and regarded as a priceless delicacy. Even those who have never experienced the bliss of tasting them know them by reputation as the acme of all that is delicious. When Mr. Johnson of Astoria wished to secure a number of the bulbs for the European market, he hired the squaws to dig them, but found that they ate them as fast as they dug them, and it was only by offering them more liberal stores of bacon and flour that he could induce them to restrain their appetites and part with the treasure."

EDITORIAL

In every acre of woodland or meadow on this planet there are enough wonderful forms of plants to provide study for several lifetimes, yet man ignores these marvels and, drawing on his imagination for his facts, constructs a variety of blood-curdling tales about plants designed primarily to shock and astound. One of the most persistent of these fabulous yarns relates to a flower that devours men, quite after the fashion of the minatour. This is the sort of story that the newspaper syndicates invariably select for reproduction in the plate matter sent to provincial dailies. Real facts are never startling enough, or perhaps they lack the human interest. Thus we get such absurdities as the following which we recently clipped from a Chicago paper: "One of the early English explorers, Hugh Arkwright, who sailed the Pacific in 1581, warned travelers against visiting El Banoor, the home of the death flower. This flower, he says, is so large that a man can stand upright inside one of its blossoms. But if he does so he will surely fall asleep, lulled by the strange fragrance it distills. Then the flower folds its petals and suffocates him. 'And so he passes into death through splendid dreams and gives his body to the death flower for food.' " To be sure we have to make allowances for the tales of returned travellers, especially those told in the early days of exploration, but we object to making any allowance for the modern newspaper which prints such stuff. No wonder the average reader finds the botanical journals a bit tame after such thrilling pabulum.

According to a recent news item a certain city in Illinois is planning to reduce ivy-poisoning by placarding all spots in which the poison ivy is known to grow. The placards are to be similar to those used to indicate contagious diseases. The whole proceeding is typical of the way in which the average botanist looks at a practical matter. A practical man would likely suggest that while the health officer was securing and tacking up his warnings, an able-bodied laborer, immune to poison ivy, would be able to destroy all the poison ivy in the town. The botanist, however, puts his trust in anathemas and in signs reading "keep off the grass."

* * *

Ever since a certain school of botanists in this country set out with the apparent purpose of tagging every variation in plants with a generic and specific name, there have been various and sundry animadversions in the public press against the wicked habit of species-splitting and name-tinkering. As a matter of fact the business has been a bit overdone in certain groups of plants, but there are signs of returning sanity in the recent manuals which refuse, though still with some hesitation, to accept the species maker's statement that there are eight or nine hundred species of hawthorn in America. The contention made by people who wish to study something besides plant names is that all this name changing does not get anybody anywhere. Changing the names of plants adds nothing but difficulty and confusion to the study of botany. Fortunately the specific names of plants are not likely to be changed very much in future, the available changes seeming to be about used up, but the stability of names is now threatened from a new quarter. There is being manifested a desire to split up each genus into as many new genera as there are species—or sometimes more. At present there is no recognized basis for establishing genera and each botanist is a law unto himself. Cases are not unheard of in which the possession of longer peduncles or broader leaves than the average is considered sufficient to justify the making of a new genus. There ought to be a sane basis for deciding what are, and what are not, good genera. If some philosophical botanist would take up the study of this subject and arrange the plants in proper genera as they should be, he would make a name for himself far more lasting than any that have thus far been made in America. No doubt there would be plenty of opportunities to get one's name after a lot of new combinations and in view of this fact we expect to see our suggestion adopted as soon as the making of new genera has run its course.

BOOKS AND WRITERS

The first volume of the now well-known "Illustrated Flora of the Northern United States and Canada," by N. L. Britton and Addison Brown, appeared in 1896 and the two other volumes necessary to complete the work were issued in 1897 and 1898. Though six thousand copies of the work were printed, the edition was exhausted within ten years and the continued demand for copies has induced the authors to prepare a second and revised edition. This has just appeared from the press of Charles Scribners' Sons. That the period which has elapsed since the first appearance of the work has been one of great activity in systematic botany is shown in the new edition which describes and illustrates about five hundred species not in the original work. Many of these are immigrants from other parts of the world, or newly discovered species, but a large share are segregates from older and well-known species which a closer study has shown it possible to separate, no matter however undesirable. There is shown, however, a commendable inclination to exclude many plants of doubtful specific value, including a large number that in recent years have been described as distinct species. The nomenclature is frankly that of the "American Code," which is to be regretted because it is so much at variance with the usage of the rest of the world. Those who are familiar with the first edition will notice very little change in the second with the exception of the added species. Some of the drawings have been remade and much bettered in the making. The work is the only complete illustrated flora of the eastern part of our country and as such will always be indispensable to the student. The price of the new edition is $13.50 net, the cost of transportation being additional.

Charles Francis Saunders, whose name is already familiar to readers of this magazine as the author of many interesting botanical notes, has recently issued a volume of tramping, camping and exploration in the Far West entitled "Under the Sky in California." In this book, which is both well written and attractively illustrated, one is introduced to a portion of California rarely seen or appreciated by the tourist. All travel becomes interesting in inverse proportion to its rapidity. To really see and enjoy canyons, mountains, deserts and the like, one must travel slowly, by wagon, on horseback, or afoot, and camp where night finds him. By methods such as these, Mr. Saunders and his wife visited the old Missions, the Mohave and Colorado deserts, the Yosemite, Santa Catalina island, and the mountains of the Coast Range, and the book, which is both an attempt to picture some of the attractions of such trips and a guide to others minded to go and do likewise, is the result. Chapters that are likely to appeal to many are those on the climate, on camp cookery, and on life and making a living in the land of sunshine. There are three hundred pages in the book. It is published by McBride, Nast & Co., New York, at $2.00 net.

Another volume has been added to the long list of books made on the plan of William Hamilton Gibson's "Sharp Eyes," books that are designed to show the curious and interesting features of the world about us. Clarence M. Weed's "Seeing Nature First" makes no pretentions to instructing the scientist, but is rather for those who are making a beginning of seeing nature. Though divided into four sections, to which the names of the seasons are given, the book is no mere journal of the days as they pass, such as beginning writers are prone to inflict upon us. The fifty or more essaylets are on such varied subjects as the color of frogs, bumble-bee blossoms, collecting cocoons, walking ferns, peat mosses, and lizards or salamanders. It is a good book to put into the hands of a boy or girl who shows signs of becoming interested in the outdoor world. It will not only serve as an agreeable introduction to the more formal studies in natural history but should go a long way toward inciting the child to investigate for himself. The book is well illustrated by drawings and photographs, though the artist is by no means the equal of Gibson. It is published by The J. B. Lippincott Company, Philadelphia.

There are all kinds of ways of breaking into botany and what may seem most attractive to one may have nothing to recommend it to another. The reviewer, however, would hesitate to recommend Frederick Le Roy Sargent's "Plants and their Uses" to beginning classes in botany, though the book has an immense amount of information in it of the kind that the general public desires and usually has difficulty in obtaining. The chapters on foods, and on flavoring, medicinal, poisonous, and industrial plants will interest readers of this class. Following these preliminary chapters come others on classification and the parts of a seed plant, and an extended chapter on various plant groups in which the characteristic features of a large number of plant families and orders are given in rather technical and not very attractive language. The book ends with other chapters on kinship and adaptation and various life histories of the lower orders of plant life. There are also some twenty pages of technical data regarding the structure and arrangement of various flowers. A curious survival of the old herbarium-making and flower analyzing ideas is seen in the important place given to the taxonomic side of the subject. This is out of all proportion to the space devoted to the structure and life processes of plants—subjects which the concensus of opinion seems to indicate are more worthy of study in school, at least. We should be inclined to say that the book will be of more value to the teacher and general reader than when used as a text book. It is profusely illustrated, there being nearly four hundred cuts in all, but many of these are stock cuts or illustrations copied from other books and frequently lack the life-like appearance of more recent illustrations, though all are sufficiently clear to be useful. The book is published by Henry Holt & Co., New York.

The interest in irises seems to be growing, a sure indication that intelligent gardening is looking up in this country. Probably the last word in irises for many a day has recently been spoken in a book by W. Rickatson Dykes which costs nearly forty dollars. This price puts it at once beyond the reach of most botanists. They will have to be content with occasional peeps into the book in some of the big libraries, but for home use, a little book by the same author will serve every purpose. This book is entitled simply "Irises" and therefore does not pretend to be a complete iris manual, but it discusses in an entertaining way, first, the *Iris* genus as a whole and then the various "sections" into which iris fanciers divide the species. Then come chapters on irises for special positions, in rock gardens, herbaceous borders and the like. The cultivation of irises and the problems connected with their growth also receive attention and the book ends with a calendar of the dates on which the different species bloom. It is issued by the F. A. Stokes Company, New York, and costs seventy cents.

In the preface to Dr. Wm. F. Ganong's "The Living Plant," the author intimates that the book is not intended for botanists, but after going through it pretty carefully we are of the opinion that it ought to be, for it is an ideal presentation of the structure and functions of plants and, though designed for beginners, is a book from which advanced students can learn much, especially as to methods of expression. The author not only has a clear and entertaining style but ever seems to anticipate the difficulties of his readers, and the book is full of ingenious ways of bringing out vividly the salient features of the subject and fixing them in the memory. The book also represents a unique line of attack in making botany attractive to beginners in that it avoids the accepted beginning with seeds and other dry material and plunges at once into the subject of leaves and their activities. The whole book thus grows naturally out of inquiries into other phases of botany with which leaves are concerned. There are eighteen chapters devoted to respiration, absorption, transpiration, photosynthesis, and allied topics, though the author prefers much longer titles for the chapters such as "The Substance that is Alive in Plants and its many Remarkable Properties" for a discussion of protoplasm. Chapters on evolution, plant breeding and classification complete the book, which is an octavo of nearly 400 pages. There are a large number of illustrations, mostly original and selected for the light they throw on the text. The book is one of the volumes in the American Nature Series published by Henry Holt & Co., New York.

Vol. 19. No. 4 Whole Number 99

THE AMERICAN BOTANIST

NOVEMBER, 1913

DEC 13 1913

25 Cents a Copy; $1.00 a Year

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JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

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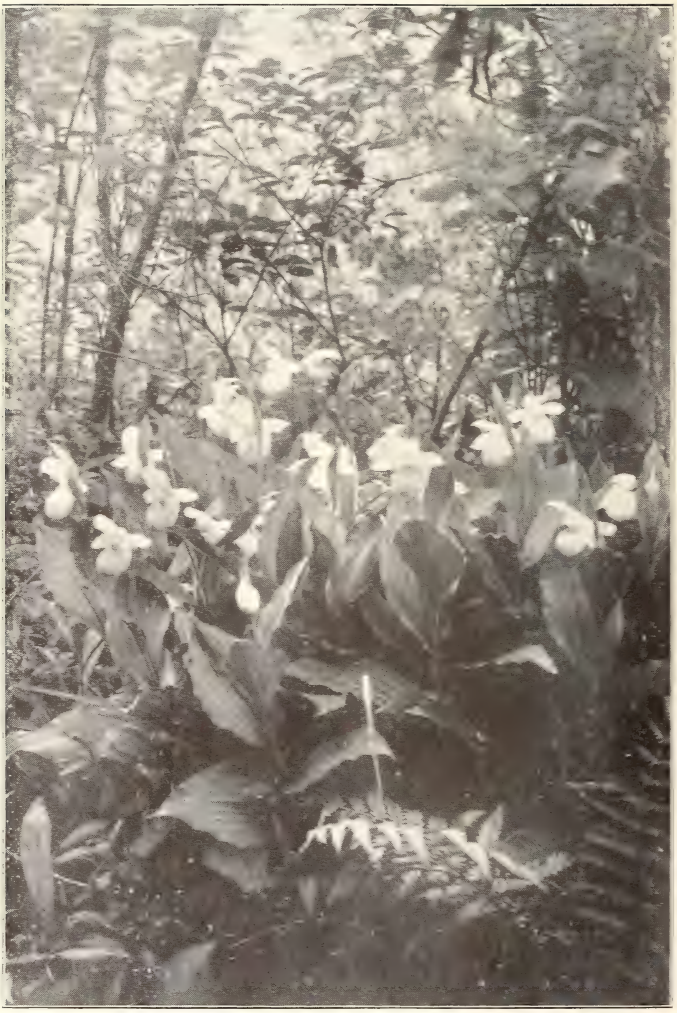


The Queen of the Moccasin Flowers.
Cypripedium reginae.

THE AMERICAN BOTANIST

VOL. XIX JOLIET, ILL., NOVEMBER, 1913 No. 4

November's sky is chill and drear,
November's leaf is red and sere,
The sheep beneath the lowering heaven,
To sheltered dale and down are driven,
Where yet some faded herbage pines,
And yet a watery sunbeam shines;
In meek despondency they eye
The withered sward and wintery sky.

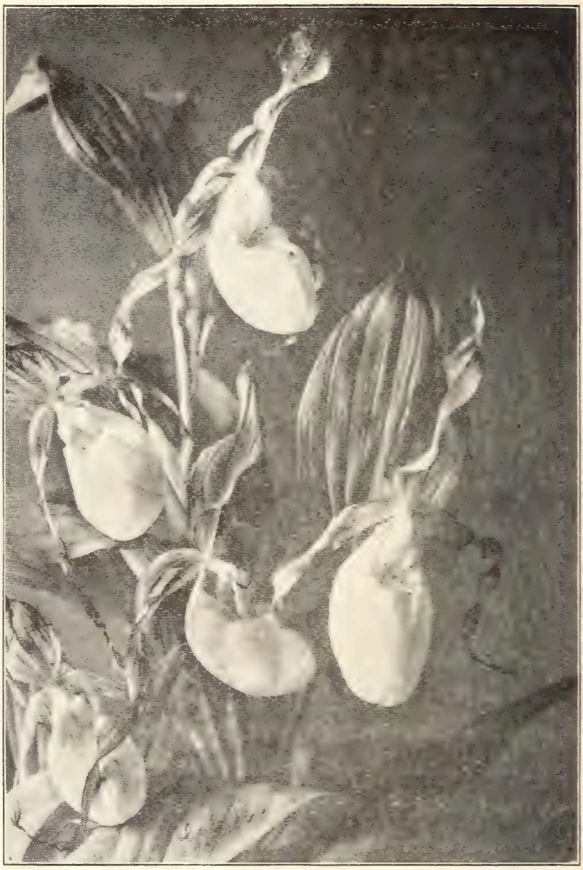
- SCOTT

THE NORTH AMERICAN CYPRIPEDIUMS

By Grace Greylock Niles.

THERE are thirteen reported species of *Cypripedium* in the coniferous forests of North America, but the eight species of the Atlantic region are very different from the five species found in the region west of the Rocky Mountain Divide. In fact, it is believed that our eastern *Cypripediums* are more closely allied to those of northern Europe, and northern Asia, than to the species of the Rocky Mountain boglands. Six of our Atlantic region species are reported for the New England States, while only a single species is found in Mexico and Panama—a region often known as the "orchid-hunters' paradise."

Botanists differ widely in their reported list of *Cypripedium* species for the world; Messrs. Bentham and Hooker of England, in 1883, named only forty species; Hooker and Jackson, in 1893, listed fifty-seven species in the "Kew Index"; and



The larger yellow Moccasin Flower.

more recently Fritz Kranzelin and Oakes Ames report at least eighty-three *Cypripediums* and several hundred natural hybrids, the latter chiefly among the exotics from the Tropics. There are also several interesting hybrids produced by crosses between the exotics with the terrestrial species. The collectors, so far, have not discovered any species of *Cypripedium* in Africa or Australia, although those regions produce a profusion of other species of the Orchis Family.

The native *Cypripediums* of northern North America, Europe, and Asia are all terrestrial. The first species reported for northern Europe, *C. calceolus,* was described by Casper Bauhin, in 1620, as "False Hellebore with a Round or Shoe-shaped Flower, *Helleborine Calceolus.*" In 1616, Dr. Rembert Dodoens, the physician to the German Emperor, christened the same species, in his "Herbalist," as "*Calceolus Marianus*—Our Lady's Slipper," and dedicated it to the Virgin Mary. The Swedish botanist, Linnaeus, in his *Species Plantarium,* published in 1753, classed Dodoens' *Calceolus Marianus,* as an orchid and christened it *Cypripedium Calceolus* in honor of the Greek goddess *Cypris*—the ancient name of Venus. The name *Cypris,* combined with *podion* signifying a sock or slipper, thus originated our present generic name *Cypripedium.* The ancient generic names of the orchids appear to be the Latin or Greek derivations describing the *common names* of those plants. The Abenakis Indians of North America pointed out the *Cypripediums* to the pioneer colonists as their *Mawcahsuns*—sandal or shoe-shaped flowers, from which originated the common name of moccasin flowers.

The thirteen native *Cypripediums* of North America are classified in three sections, according to their structure. They differ from other genera of the Orchis Family in having two, instead of a single anther, united with the pistils which form the column. Charles Darwin and John Lindley considered that a multitude of forms must have been swept away between *Cypripedium* and the other genera of the family. The rare Ram's Head Moccasin Flower (*C. arietinum*) produces three sepals, free to the base. In all other *Cypripediums,* the two lower sepals are wholly or imperfectly united at the base, and appear as a single sepal. The Ram's Head, therefore, has well been characterized as the "connecting link" between *Cypripedium* and other genera of the Orchis Family.

Cypripedium arietinum, one of the pigmies of the genus, is considered the rarest species in the world. It was first discovered near Montreal, Canada, in 1808, and several plants were sent to London, where they were cultivated as "Chandler's *Cypripedium.*" The flower is a dull mottled, purple and white, with the labellum conical, and the sepals and side petals free to the base, and of a green, brown-pink color. In certain positions, the blossom resembles a ram's head, from which arose the name, *arietinum*. The species ranges from Quebec, south to Connecticut and westward from the Maine woods to Minnesota and the Great Lake region. It has the most limited range of our New England species. A few years ago this species was discovered by the collector, Abbe Delavay, in Yun Nan Province, China. As yet, none of the Rocky Mountain *Cypripediums* have been found in that region.

Cypripedium reginae, commonly known as the showy Moccasin Flower, was considered by Mr. R. A. Rolfe as the most beautiful species in the world and the most charming among our natives of North America. It was first collected by the botanist, Carnoti, in Canada. He christened it the Canada Lady Slipper, *Calceolus Marianus Canadensis* in 1635, in his *"Canadensium Plantarium."* Parkinson also described the species as the Greater bastard hellebore, or Lady slipper, in his "Theatre of Plants" in 1740. Twenty-two years later Linnaeus described the same species as a varietal form of the European Yellow Lady Slipper, known as *Cypripedium calceolus*. The latter is almost identical with our North American yellow moccasin flowers, *C. hirsutum* and *C. parviflorum.*

The Queen of the Moccasin Flowers, therefore, was not designated specifically as a species of *Cypripedium* until the American botanist, Walter, in 1788, christened it *C. reginae* in his "Flora of Carolina." In the same year, the European botanist, Salisbury, in a paper before the Linnaean Society of London, christened the species *C. spectabile,* but the name was not published until 1791. The name *reginae* refers to the regal or queenly appearance of the flowers, and the name *spectabile* also alludes to the beautiful spectacle of these plants in the boglands. A pure white form, rarely found, was designated *C. album* in Aiton's "Catalogue of Plants," in 1789, and Lindley, in 1840, adopted Aiton's name for our species, so that the plant has been known by several names since Carnoti first christened it in 1635.

The pink Moccasin Flower.

The leafy stems of this queen of the moccasin flowers rise three, and often four feet in height and resemble indian poke or hellebore, with which they are often found in quaking boglands. The terminal flower-cluster contains from one to three and sometimes four large waxen-white blossoms tinged with a deep rose-purple or magenta. The species ranges from Nova Scotia, south to Alabama; westward from the Maine Woods to Walhalla Mountains, North Dakota, and the Barrens of Kentucky. In 1891, A. E. Pratt discovered several fine plants of *C. reginae* in a bog on the Thibetan frontier of Asia, and sent some of them to the Kew Garden, England, for cultivation. The report of both *C. arietinum,* and *C. reginae,* growing naturally in China, confirms the close relationship often noticed between the flora of eastern North America and that of Asia.

Our small white moccasin flower (*C. candidum*) was first collected in Pennsylvania, although it is better known as a prairie species to-day. It is found in damp hollows, where it flourishes with the iris, painted-cup, and crimson phlox. The plant is small and the interior of the tiny white slipper is ornamented with crimson spots. The graceful sepals and side petals are of a greenish-crimson color. The species is most nearly allied to *Cypripedium reginae,* and is easily cultivated in our gardens. It has a range from Connecticut, westward to North Dakota and Kentucky.

The golden moccasin flower (*C. irapeanum*) found in the oak forests of Mexico was considered by Lindley as the largest and most magnificent *Cypripedium* in the world. It is designated by the Spanish and Mexican Indians as "Fleur dele Calavera," and "Fleur dele tete de mort"—the flower of the head of death. This moccasin flower is rarely collected by the natives, since they are very superstitious and fear the evil spirit, which they believe, haunts its trail. *Cypripedium irapeanum* is the only terrestrial species which produces a woody stem. It rises four feet in height and is adorned with a terminal cluster of three to eight large, golden shoe-shaped blossoms, which resemble *Cypripedium reginae* in structure. The labellum is of a dark gold, adorned within with scarlet spots; and the short, blunt sepals and side petals are of a pale yellow hue. The species—the only terrestrial one reported for Old Mexico, ranges along the grassy hillsides in the oak forests, from New Mexico southward to the Isthmus of Panama.

Our two yellow moccasin flowers (*C. hirsutum* and *C. parviflorum*) are among the most common of the native *Cypripediums,* and are nearly related to the European yellow lady slipper. *Cypripedium hirsutum,* the larger species, ranges from the sub-Artic lands, where it is reported in latitude 54° to 64° North, southward to Alabama and westward from the Maine Woods to Colorado and beyond. It is easily cultivated.

The small yellow moccasin flower (*C. parviflorum*) is the only fragrant *Cypripedium* reported for the Atlantic region. It is nearly related to *C. montanum,* a fragrant species of the Pacific Slope and is frequently found with *C. hirsutum,* with which it intergrades. It has a similar continental range, although it does not creep so far North. It is the most easily cultivated among our native species.

The common pink moccasin flower (*C. acaule*) known as the whippoorwill's-shoe, belongs to the two-leaves section. The scape rises from the earth between two large, basal leaves, while the terminal, large, pendulous slipper is bi-lobed. It is of a delicate pink, green, and white color, with interior veinings of dark pink. *Cypripedium acaule* has a range from Newfoundland southward to Alabama and westward from the Maine Woods to Minnesota and Kentucky. In New England it is found in sphagnum bogs, and in dark conifer woodlands in company with *C. arietinum, C. hirsutum, C. parviflorum,* and *C. reginae.* Among our native *Cypripediums* this is the most difficult to cultivate.

The dwarf yellow moccasin flower (*C. pusillum*) is one of the smallest species known. It was first reported from Florida by R. A. Rolfe. It also belongs to the two-leaved section, and has been confused, as a varietal form of *Cypripedium fasciculatum*—the pigmy species of the Pacific region. The scape is very small, and produces a raceme of two or three terminal shoe-shaped flowers. The labellum is light yellow, with veinings of brown-purple color.

Cypripedium Californicum is the most beautiful species found west of the Rocky Mountain Divide. It is the only native which produces a long raceme of flowers, and is endemic to the Pacific Slope. It was found by Douglas in company with the pitcher plant (*Darlingtonia*) in a boggy meadow at the base of Mount Shasta, California. Prof. Asa Gray described the species in 1868. The large, leafy stem of the plant rises three or four feet high. The upper eight to twelve bract-like leaves, are four inches long, and from the axils of each alternates a simple raceme of small, dainty, rose-pink moccasins, similar to those of *C. reginae* in form and coloring. These flowery slippers remind one of little papoose shoes, hung on pegs, by some phantom Indian squaw. The labellum is about the size of that of *C. candidum,* of a pink color overflowing with a darker wine color; the blunt sepals and side petals are similar in shape to those of *C. reginae,* although of a green-yellow, instead of waxen white hue. The species has a range from northern California throughout Washington, Oregon, and Idaho. It is rarely cultivated.

The small white moccasin flower (*C. passerinum*), although nearly related to the racemed moccasin flower (*C. Californicum*), is quite unlike it. The leafy stem produces a terminal, shoe-shaped, white flower, and the plant is small. The species has a range from the pine forests along the sandy banks of Yukon river, Alaska, southward to Oregon, Montana, and California. It is rarely cultivated.

The fragrant white moccasin flower (*C. montanum*) is the only perfumed *Cypripedium* of the Pacific region, and it is closely related to the fragrant yellow moccasin flower (*C. parviflorum*) of the East. The leafy stem produces a terminal cluster of two or three pure white, shoe-shaped flowers, a trifle larger than those of *C. candidum*. The interior of the slippers are adorned with purple spots; and the sepals and side petals are of a brown-pink color. The species has a range from British Columbia, southward to Washington, Oregon, Montana, Idaho and California. It is easily cultivated.

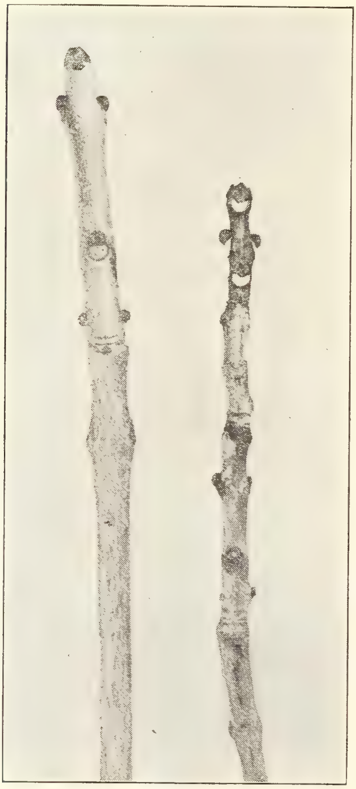
The varigated moccasin flower (*C. guttatum*) ranges nearer the North Pole than any other *Cypripedium* in the world. It has been collected in Lapland, Sweden, Siberia and Russia, from which region it may have migrated to Alaska. The plant is smaller than the yellow lady slipper (*C. calceolus*) of northern Europe. The scape rises from the earth between two basal leaves and produces a terminal shoe-shaped flower. The labellum is varigated with pale yellow, dark pink, purple, green, and gold, and the alert sepals and side petals are of a dark green. The species ranges from the spruce forests of Alaska in latitude 68° North, southward to Montana. Mr. John Burroughs, a member of the Harriman expedition, collected the plant on Kadiak Island in Alaska.

The green moccasin flower (*C. fasciculatum*) is one of the pigmy *Cypripediums*. It is closely related to the dwarf yellow moccasin flower (*C. pusillum*) of Florida, with which it has been confused. The scape of the Rocky Mountain species rises six inches in height between two basal leaves, two to four inches in length. The scape produces a terminal raceme of two or three small, shoe-shaped, greenish flowers. The alert sepals and side petals are of a yellowish hue. The species resembles the varigated moccasin flower of Alaska, and has a range from Oregon, Idaho and Nevada to California. It is rarely cultivated.

IDENTIFYING ASH TWIGS IN WINTER

By W. M. Buswell.

ALTHOUGH there are several books describing the appearance of trees and shrubs in winter and supposed to be the means for their identification, there does not seem to be a description of the white or black ashes by which they can readily be distinguished at this season. It is usually as easy to distinguish a common elm from the slippery elm or a red oak from a black oak by the buds as by any other means and in many other trees where the difference in bark and foliage is slight and variable, the buds often show a marked difference



Ash twigs. Black ash on left, white ash on right

With the black and white ashes, however, it is just the other way about. One can easily identify the two trees in summer by the sessile leaflets of the black ash and the petiolulate leaflets of the white ash, or by the samaras of either tree when present, but naming the species from the bud alone is a more difficult matter. There is a way, however, by which this may be accomplished and even the twigs may be identified at a distance.

This identification is accomplished by means of the leaf-scar which in the white ash is shaped like a crescent with the points up and partly surrounding the bud, while in the black ash the scar is either straight across on the upper side or only slightly curved, the two upper corners being round instead of pointed, with the bud either entirely above the scar or only slightly set in it.

THE PRODUCTION OF NEW FORMS IN RUDBECKIA

By Willard N. Clute.

PLANT genera usually possess a good many characteristics that are not taken into consideration by the systematist. With him, form, size, structure, outline, and similar features have the most weight, since by such characters he may most readily distinguish one species from another or identify an unknown specimen, but there are many less obvious peculiarities in any closely related group of plants which may well engage the attention of the student and prolong his interest far beyond the identification stage of his botanical investigations.

One of the most interesting of these lesser plant characters is the brownish-red color that pervades the genus *Rudbeckia,* the group to which the coneflower belong. In this genus, the ray flowers are normally yellow, but in many cases the disk flowers have a tinge of brownish-red, which is deep enough to be noticeable, and in our commonest species, *Rudbeckia hirta,* it is so prominent as to give a basis for the common name, the plant being generally known as black-eyed Susan.

Though the brownish-red color of *Rudbeckia* flowers is not an exclusive family peculiarity, it is so conspicuous in this genus as to be remarkable. In several species the red-brown color is not confined to the disk but spreads out on the ray flowers in a circle of color that adds considerably to the beauty of the flower. *Rudbeckia amplexicaulis* usually has such a circle of color in its flower-heads and the nurserymen have produced a form very similar to it from *Rudbeckia speciosa* which is known as *bicolor*.

That the color which characterizes other members of the family is apparently only latent in the flowers of *Rudbeckia hirta* must have been brought to the attention of every close observer who has had occasion to pass through any considerable area of this plant in bloom. It is not difficult to find specimens in which the rays are marked in one way or another by touches of reddish-brown. Occurrences of this kind have been recorded in the pages of this and other botanical publications and in some cases efforts have been made to continue such plants in cultivation.

The removal of these plants with abnormally colored flowers to the garden, has apparently always resulted in their returning to the regular color pattern. The color seems to be in some way connected with vegetative vigor and disappears when the nutrition of the plant is interfered with. Some time ago, however, it occurred to me that even if the flower-heads reverted to the normal color, the capacity for producing various interesting variations from the type might be inherent in the seeds from such flower-heads, and in order to test this, seeds from the abnormal plants were sown and a hundred or more seedlings secured. These have now produced their first crop of flowers and, much to my delight, have far outdone any wild plants that I have ever encountered. The colors are not only deeper and more abundant, but several color patterns not previously reported have appeared. These, though varying considerably, tend to group themselves around three principal patterns. In the commonest, there is a blotch of bright red-brown on the inner third of each ray-flower making a striking circle around the disk. In a second group, the red-brown spreads throughout the ray-flowers, giving them a deep orange-brown tinge which is noticeable even in the bud, and though the ray-flowers are folded with their upper surfaces inward, it was possible to select the specimens with this color before the rays were spread. The third, and in some ways the most interesting type, is an exact reversal of the first one, the ray-flowers being yellow at the base and brownish-red at the tip.

There seems to be no question as to the forms produced being elementary species in the sense that DeVries uses this term. In the wild, these, and other departures from the normal, though doubtless often produced, have been swamped by the abundance of the common form, but when the abnormal plants are removed to the garden and the tendency to vary encouraged, a large number of interesting forms can be produced. The most striking of those that have appeared among my seedlings will now be bred by themselves and in time, no doubt, some of them will find their way into the nurserymen's catalogue.

In order that the forms may not lack for literary handles, I purpose giving them scientific names. Were I to follow the example set by devotees of the evening primroses, violets and hawthorns, I would describe these forms as good species—as indeed they are, judged by the standard for hawthorn or evening primrose species—but I prefer to call them varieties of the common black-eyed Susan, leaving their elevation to specific rank to the first experimental botanist who tackles the genus. The forms are characterized as follows:

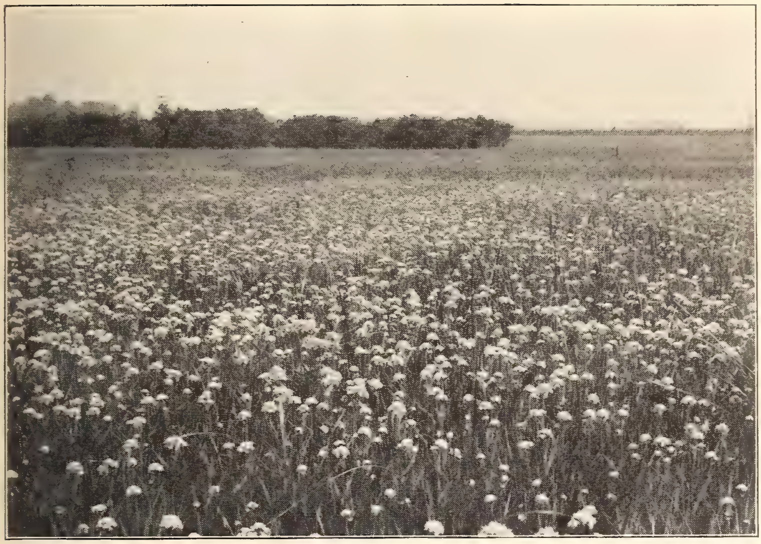
RUDBECKIA HIRTA var. BICOLOR n. var. Like the type with the exception that the inner third of each ray-flower is colored a deep red-brown. Type in the author's collection.

RUDBECKIA HIRTA var. RUBRA n. var. Like the type with the exception that all the ray-flowers are colored a deep orange-brown, which is especially noticeable on the back or outer surfaces. Type in my own collection.

RUDBECKIA HIRTA var. ANNULATA n. var. Similar to the type but with the outer tips of the ray-flowers light orange-brown, the ordinary yellow color of the rays thus forming a ring or circle about the disk flowers. Type in my collection.

It may be added that the law of the correlation of color holds good for these plants. Those that are likely to bear abnormal flower-heads may be selected in the seed bed, long before it is possible for them to produce flowers. Indeed, should anybody wish to follow my experiments and lack brown-blotched specimens with which to begin, it seems likely that the common form with the darkest colored stems could, in all probability, be induced to break and give forms such as my plants have given. The color seems to be latent, rather than absent. At any rate, the experiment would be worth trying. Among my specimens of the common form, a semi-double variety has developed. This will be carefully propagated in expectation of securing a completely double form.

The results attained with *Rudbeckia* in so short a time is additional proof of the statement, frequently made, that almost any plant, properly handled, can be made to yield a variety of new forms. The greatest success will likely attend one's efforts if they are directed toward encouraging variation in parts already known to vary, but a careful selection of normal plants subsequently bred with a single end in view ought to give interesting results if long continued.



A RARE PLANT BECOMES A WEED

THE accompanying photograph is a view in a cranberry bog in New Jersey, but the reader should not hastily jump to the conclusion that the flowers shown are the blossoms of the cranberry. The indication for a crop are not half so bright as the flowers would indicate. Far from it. The cranberries are decidedly recessive, as Mendel might be tempted to put it, were he the owner of the bog. The dominant plants are specimens of the red-root (*Lachnanthes tinctoria*), a rather uncommon plant found along the Atlantic seaboard from Massachusetts to Florida. It grows two feet or more high, with a close, woolly cluster of bright yellow flowers. The individual flowers are about half an inch in diameter and the cluster itself may become five or six inches across.

Though a sight of the plants in bloom is always pleasing to the botanist, it produces far different sentiments in the breast of the cranberry grower into whose bogs the red-root shows a disposition to spread, to the detriment of the natural accompaniment of our national bird. The photograph shows a particularly clear illustration of the fact that "A weed is a plant out of place." No matter how handsome its flowers or thrifty its foliage, if a plant interferes with our gardening and farming operations, it is a weed.

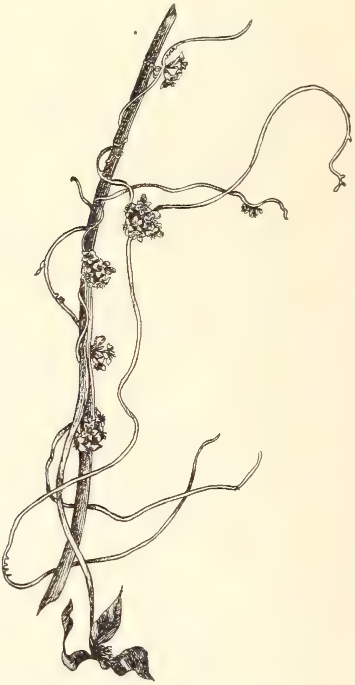
Many of our weeds have handsome flowers. The jimson weed, the toad-flax, the bind weed and many others are in this class, but they are weeds none the less. We commonly think of a weed as a plant that has developed weediness through ages of combat with the agriculturist, but in the case under discussion we have an instance of a weed developed at a jump from a hitherto harmless plant of retired bogs—a sort of novice at the weed business, but pretty successful at that.

THE CLOVER DODDER

By S. I. Anthon.

IN this southeastern section of the State of Washington we have immense green sweeps of hillside made up of fields of clover and alfalfa. Occasionally a keen eye may see in the midst of the clear green a small yellowish patch, seemingly made up of fine threads lying on top of the green. This is the beginning of a dodder plant. Day by day, the yellow stain spreads until at last the green itself seems to shrivel up. The dodder (*Cuscuta epithymum*) has taken possession of the field and it means unceasing labor to drive it out of its easily won territory. Formerly, much dodder seed was sold with clover and alfalfa seed, but now that the state colleges willingly test these seeds but little of the plant escapes attention. Dodder seed closely resembles clover seed, differing in that it is a trifle smaller and is angled where the clover seed is round.

The life history of the dodder is most interesting. After the seed falls to the ground it lies dormant for the usual length of time and then sprouts into a slender stem with small leaves —an independent plant! The stem seems almost a purposely conscious organ. It soon elongates, twisting and turning until it comes in contact with a plant suitable for a host when it begins to coil about it, sinking its fang-like haustoria through the bark in order to absorb nourishment from its unhappy victim. Having no further use for root and leaves these shrivel up and die, a few leaves being left in the form of tiny alternate scales on the winding threads. Instead of leading an independent existence the plant has become a total parasite, consisting of the slender twining stem and minute scale-leaves, broken here and there by small clusters of whitish flowers. These flower masses vary in the number of flowers, having from two to twenty-five flowers in a compact cyme. The individual flower is a small campanulate blossom, arranged on the plan of five. In color it is a dull white with here and there a pale greenish tinge. There are lacerate scales within the flower throat, the stamens usually being attached just above the scale.



Stems and Flowers of the Dodder.

The dodder, of which there are in the State seven kinds, was first collected here by Douglas. Most of our dodders are forms which have come in with seed from Europe and have spread rapidly from the centers of infection. The dodder frequently appears in the most unexpected places. I recollect being frantically called over the telephone by one of my friends who, knowing my hobby, insisted on my coming over at once to see her chrysanthemums which were full of thin yellow worms! I chuckled to myself as I hurried over for I thought I recognized the ubiquitous dodder in her yellow worms. It was a rather shame-faced gardener to whom I explained the identity of the worms, but it is always a surprise to find the number of people who are ignorant of even our common plants. The dodders are not particular as to their host; they grow commonly on our clovers and alfalfa but I have frequently seen huge masses of it coiling about a dry and gnarled sagebrush to absorb from it its scanty supply of nourishment and water.

THE GRAY OR SPANISH MOSS

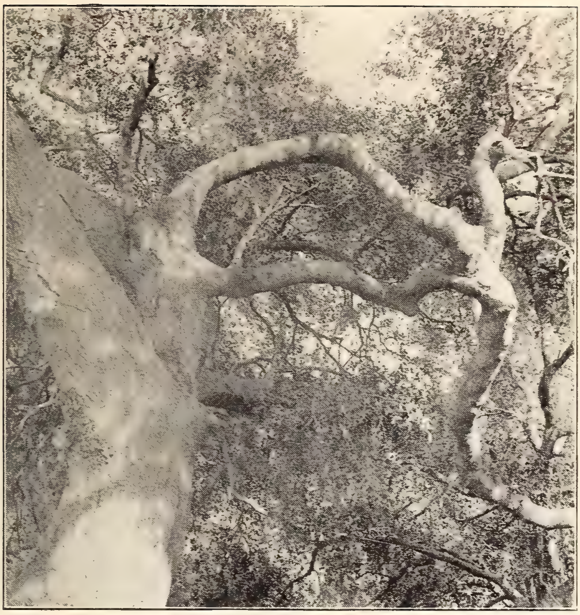
By Mrs. Georgia Torrey Drennan.

THE gray moss (*Tillandsia usnoides*) grows from the Dismal Swamp south to the Gulf of Mexico, in all heavily timbered low lands. In some respects it is a weird feature of vegetation and at all times, it is quite picturesque. Composed of gray, scurfy, thread-like branching stems with linear awl-shaped leaves, it depends in long, full, swaying draperies from the spreading limbs of trees, feeding upon the moist air of the swamps. The small sessile green flowers are produced in summer and the ripened ovary forms a narrow, three-valved pod filled with club shaped, hairy-stalked seeds.

Though not a parasite, it yet attaches itself to the spreading limbs of trees, and makes profuse growth. Its principal affinity is the live oak. *Magnolia grandiflora,* cypress, cedar, and pine in close juxtaposition to the live oak, will be sparsely covered while the oak will be heavily draped. As it hangs from the gigantic trees, the gray moss is filmy and apparently as soft as smoke, but taken in the hand it is harsh and wiry. The new growth, lengthening the moss, floats lightly on the air, lovely to behold. Season by season, it increases in bulk and length, and a tree supporting its first colony of light, thin moss one year, will the next year be densely covered. Yet the trees do not suffer. They do not part with sustenance. The air and moisture support the moss.

Time was when the Spanish moss had no commercial value, but now the demand for what is known as vegetable hair is extensive and is yearly increasing. It is used in mattresses, saddles, upholstery, horse collars and other manufactures. The gray epidermis is removed by a sweating process in vats, located in the forest where the moss is pulled from the trees. When removed from the vats and dried, the black inner fibre, a vegetable hair, is strong, wiry and clean. The shipments from the South to all parts of the United States are immense while the local consumption is considerable.

The moss is called the lazy man's crop. It has neither to be sown nor worked; simply harvested and, in the local phrase, "cured" for commerce. Notwithstanding its annual consumption, there is no perceptible diminution in the supply.



A NATURAL TREE GRAFT

THE essential thing in grafting is that the growing cells, or cambium, of stock and scion shall meet in order that further growth may form a firm union between the two. It occasionally happens in nature that one branch rubbing over another exposes their respective cambiums and then under favorable circumstances a similar union may result. The accompanying illustration shows an instance of this kind that has occurred among the branches of an ancient live oak (*Quercus agrifolia*) on the Pacific Coast. The tree is growing on the Providencia Ranch near the Los Angeles river a short distance from Hollywood, and the photograph was kindly sent by Mr. Fred E. Burlew.

NOTE *and* COMMENT

Familiar Shrubs from the Wild.—Every garden plant that differs from wild plants of the same kind has reached its perfection in one of three ways: it may have been improved by selection, it may have been crossed with other forms, or it originated in the wild as a "sport." The sports have a peculiar interest for us from the fact that they represent Nature's attempts at improving things. For ages she has been encouraging plants to throw off these variations from the normal. If by chance they are able to survive we have a new variety or species, but usually such variations are swamped by the multitudes of the common form. When man cares to protect these unusual plants they are often found to be quite superior to the type. The double-flowered crab, often called Bechtel's crab, is an instance of this kind. It is a sport from *Pyrus Ioensis* which was taken from the wild by Thomas Bechtel near Staunton, Ill., about 1888. The shrubs from which the specimens came had been known for nearly fifty years before anybody had thought it worth while to secure and propagate so desirable a form. The weeping mulberry was found in 1893 by J. C. Teas among a lot of seedlings in his nursery at Carthage, Mo. The cultivated form of the common hydrangea, *Hydrangea arborescens sterilis,* was found about 1892 by J. A. Shafer near Pittsburg, Pa. In this form the flowers are all enlarged and sterile. Several other hydrangeas with this peculiarity are known. The cut-leaved form of the staghorn sumac (*Rhus typhinia laciniata*) was found many years ago at York Beach, Me., by J. W. Manning and all the cut-leaved plants seem to have descended from this single specimen. Many different cut-leaved elders are known. One of the latest to be found was discovered by J. H. Ferriss at Starved Rock, Ill., about ten years ago. This is a form of the red-berried elder (*Sambucus racemosa*), but similar forms of the common elder and of the European elder (*S. nigra*) are known. The familiar "golden glow" is a sport of *Rudbeckia laciniata* which originated on the prairie somewhere in the vicinity of Chicago about 1894. It was introduced to the public by Jens Jensen and C. W. Eagan. All of the finds mentioned have considerable commercial value and there are no doubt many quite as desirable waiting for some discerning collector to discover them.

GRASSES AS WEEDS. — The quack grass (*Agropyrum repens*) probably fills every requirement in the farmer's definition of a weed, but there are three annual species which are fully as annoying to the gardener. These are the foxtail (*Setaria*), the crab grass (*Panicum sanguinale*), and the witch grass (*Panicum capillare*) . The efficient way in which these weeds conduct their annual campaign against the cultivated vegetables and flowers seems little short of intelligent. They do not come up early in spring to be cut down by the watchful gardener in the full swing of his spring enthusiasm for outdoor exercise; instead they wait so long before appearing that the novice may be deceived into thinking that he has vanquished them. But when the summer sun has baked the ground and the moisture has evaporated to the point where cultivated things begin to wilt at noonday, they appear, fresh, green and thrifty. They luxuriate in soil that is almost dust dry and their ability to get along with the minimum amount of moisture goes far toward making them invincible. How they manage to exist is more or less of a mystery. In all probability they have an exceedingly high osmotic pressure in their cells which enables them to extract moisture from such unfavorable surroundings.

A Gigantic Cone.—To those who are familiar with the fruits of the Gymnosperms, the great cones of some of the western pines, which often measure more than a foot in length, may seem gigantic but these are by no means the limit of what Nature can do in the matter of cones. Dr. C. J. Chamberlain, who has recently returned from a tour of the world, made for the purpose of studying the *Cycads,* reports that the cones of *Encephalartos caffer,* a species of South Africa, has cones that sometimes reach a weight of ninety pounds. This is the heaviest cone produced by a Gymnosperm. An allied species, *Macrozamia Denisoni,* from Queensland, Australia, has a cone that often weighs seventy pounds and is more than three feet long. The individual seeds in such a cone are large enough to be made into match boxes. The cones, as most people are aware, are really ripened fruits, the young cones being in fact the pistillate flowers. Their size ought to make them prime favorites with the botanist who so often in studying other flowers must make use of a lens or microscope. In these plants, all the floral parts are constructed on a generous plan. Even the sperm cells, which unite with the eggs, are large enough to be seen with the unaided eye and have the added peculiarity of being ciliated like those of the lower orders of plant life.

The Fragrance of Plants.—Flowers either have to be curious, beautiful or fragrant to gain a place in the garden. Lacking these qualities the gardener is likely to call them weeds. The fragrance of plants does not always reside in the flowers, though we usually think of the flowers when we think of fragrant plants. The fragrance may proceed from almost any part of the plant. In the lavender, thyme, and the mint family generally, the odor is found in the leaves and stems, in the cinnamon tree the odor is in the bark of the trunks and branches; in the sasafras in the bark of the root; in the sandal-wood and camphor tree it is in the wood; in the iris, ginger and sweet flag it is the rootstock; in the vanilla, anise, and caraway, it is the fruit; in the nutmeg and tonka bean it is in the seed; and in mace it is the aril surrounding the seed. In some species, different parts of the plant have different odors; thus the orange yields one kind of perfume from its leaves, another from its flowers and still another from its fruits. In the sasafras and sweet flag the leaves have a taste and smell quite different from the taste and smell of other parts of the plant.

A BULBOUS EPIPHYTE.—Epiphytes are plants which grow upon others without depending upon them for food. In temperate regions, many mosses, lichens and a few ferns are epiphytes, but it is not until the tropics are reached that we find flowering plants of this nature. In the tropical rain forest, however, there are numerous flowering plants that have become epiphytes, notably the orchids, the pitcher plants, and the plants of the pineapple family. The position of these plants on the trunks and branches of trees, prevents their absorbing water as needed, as plants rooted in the soil are able to do, and they are, therefore, obliged to keep pretty close to regions where the rainfall is frequent and abundant. As a rule the epiphytes possess cisterns or other devices for storing the precious moisture against a time of drouth. In a country where it is always summer there is no need for plants to store food and, as might be inferred, plants with bulbs, corms, or thickened rootstocks are exceedingly rare among epiphytes. A few species have bulbous parts, usually stems, but these are for the storage of water, not food. A remarkable exception to this condition is found in a new plant reported from South Africa in which there is a bulb of the conventional style. The plant belongs to the Amaryllidaceae and has been named *Cyrtanthus epiphyticus*. It is said to be the first Amaryllidaceous plant recorded as an epiphyte. The plant grows with its bulb embedded in the moss on the trunks and branches of a species of yellow wood (*Podocarpus*).

FLOWERING PLANT FORMS.—The true flowering plants divide naturally into the two groups of Monocotyledons and Dicotyledons, the separation depending upon whether they have one or two seed leaves. The dicots comprise by far the larger group, a conservative estimate placing their number at nearly 110,000 species while the monocots number less than 25,000. In the dicots there are approximately 46,000 species with sympetalous flowers, that is, with parts united, and 62,000 with polypetalous and apetalous flowers. In this latter group, 50,000, or nearly five-sixths, have superior ovaries. In the sympetalous flowers, 22,000, or about half, have superior ovaries. Approximately 12,000 plants in the monocots have superior ovaries. A curious thing connected with this subject is the fact that there are practically no monocots with sympetalous flowers. The few instances that occur, such as *Convallaria*, *Asparagus* and *Aletris* serve as the exceptions which prove the rule.

TUBE-ROSE OR TUBER-OSE. — The common names of plants are derived from many sources and are often older than the scientific terms applied to them,—especially if they happen to have beautiful flowers or a reputation for curing disease. In many cases the scientific names are adaptations of the older common names given intentionally by educated people, but in the common name given to that cinnamon-scented bulbous plant commonly called the tuberose we have an example of how ignorance may also contribute to the nomenclature of plants. Our plant, which in scientific parlance is *Polianthes tuberosa* has nothing in connection with roses. The popular name is a corruption of the specific name, *tuberosa*, which means "producing or resembling tubers." *Polianthes tuberosa* was apparently too lengthly for popular usage and the first half was accordingly dropped, the plant then being known as *tuberosa,* just as the florist speaks of American beauty roses as "beauties" and chrysanthemums as "mums." Apparently *tuberosa* had no meaning to the average gardener and so it gradually came to be known as tube-rose—a rose with a tube, as the name is now sometimes translated. The latest dictionaries give authority for either form of the name and so the tuber-ose is slowly becoming a tube-rose, because those who use the word are unfamiliar with the Latin. There is a large number of plants with common names derived from the scientific such as rose, aster, peony, lupine and the like, but cases in which the specific name has given rise to the common name are exceedingly rare.

FLOWERS AND THE CAMERA.—The amateur photographer with a kodak soon discovers that there is a great difference in the way different flowers affect the sensitized plate or film. White flowers come out clear and distinct, blue and pink flowers are nearly as good and red is not impossible, but when it comes to yellow and orange flowers the trouble begins. One may turn the camera on a clump of plants fairly blazing with yellow only to find after the negative has been developed that the flowers can be distinguished from the leaves only with difficulty. To oblige the yellow to make its mark, one must slip over his lens a ray-filter which sorts out the rays of light and thus produces the desired effect. Many of the yellow flowers among the compositae have another surprise in store for the photographer whose equipment lacks a ray-filter. Some day he photographs a clear yellow composite and when the plate is developed he finds the image of a two colored flower. The rays, which appeared to the eye as clear yellow, now show the inner half to hold a darker color. When the color screen, however, is placed over the lens the photograph obtained shows no trace of this second color. Evidently the inner half of the rays reflect the light in a way that affects the sensitive surface, though the eye cannot distinguish it.

The peculiarity is now known to belong to several of the Compositae, among them various forms of the common sunflower as well as a Mexican species, *Bidens heterophylla,* in which the phenomenon appears to have been first noticed. The writer of this paragraph has found the peculiarity in another sunflower, *Helianthus laetiflorus,* in *Coreopsis trichosperma,* and in *Rudbeckia triloba.* It is to be noted that the plants in which this feature is present, belong to a group in which the ray flowers are often marked with brown or brownish-red at the base, though some of the species which affect the photographic plate in this way have no known forms with this peculiarity. We may suggest the hypothesis, however, that in plants which show this feature a red color is latent and could be brought out by breeding. To make a series of photographs of flowers of this kind would be an interesting pastime and would possibly indicate a number of plants from which a start might be made in breeding.

Varieties of Asters.—The herbarium kind of botanist often speaks disparagingly of the gardener's favorites but the latter individual makes everything even by considering all plants growing without cultivation as mere weeds. It is not uncommon for the thoughtless to ask "Is it a flower or a weed?" when some new specimen with handsome flowers is brought to their notice. All cultivated flowering plants, must of course, grow wild somewhere, though in many cases the garden forms have been improved by inducing them to bear differently colored or larger flowers, or more of them. It may astonish many botanists, however, to know that gardeners have no less than ten named varieties of the New England aster (*Aster nova-Angliae*) while the botanical manuals have only one—*rosea.* Among the gardener's creations are plants with deep crimson flowers which quite outclass the pink-flowered form that botanists have thought worth while dignifying with a name. Many other species of our native asters are cultivated and are regarded by plant lovers as quite as handsome as any other garden flowers. The New York aster (*A. nova-Belgii*) has no less that twenty-six varieties in cultivation, the flowers ranging in color from white to clear blue and deep pink. If ever the species maker gets hold of an up-to-date nurseryman's list what a changing of names and making of new species there will be!

Stability at Last.—One thing that every botanist desires is stability in plant names. Some fifteen or twenty years ago, we were told that to get stability, all we had to do was to follow the lead of certain advocates of an "American Code" for naming plants. A good many students who thought they could forcast the future to some extent were dubious about such methods of obtaining stability but others showed their confidence in the new movement by using the nomenclature in the books they issued. The monumental "Illustrated Flora" used this nomenclature and now that the second edition has appeared we can see just how this stability works. We find that during the time that elapsed between the first and second editions, 136 genera and several hundred species have had a change of name. This ought to settle those obstreperous individuals who keep repeating that there is no stability under the American Code. If changing so many plant names isn't stability, what is it?

Wine-red Sunflowers.—It is likely that the common garden sunflower is well known to everybody. The large golden-yellow ray-flowers and dark disk-flowers make it a most conspicuous object whether growing in the garden or as an escape along roadsides. In its native home, between the Mississippi river and the Rocky mountains, there is a variety *lenticularis* which occasionally has the base of the rays marked with chestnut-red. Recently, Prof. T. D. A. Cockerell, who found plants of this kind, resolved to see what could be made of it by breeding, and by crossing it with an English variety *primulinus,* he has produced a new form with wine red rays. This he has named *vinosus.* The reason for crossing the chestnut-red plant with the primrose-colored one was to avoid the orange tint which was rightly regarded as preventing the chestnut-red from becoming clear red. In *primulinus* the orange is lacking and the resulting cross had rays of "rich, deep wine red." The new form is soon to be put on the market and will no doubt do much to make the garden bright in summer.

Anthesis.—The term anthesis is used to indicate the period of time in which a given flower is concerned in pollination. The word is sometimes taken to mean the expanding of flowers, but many flowers, for example those without floral envelopes—calyx and corolla—have nothing to expand. The end accomplished in anthesis, is, of course, the fertilization of the eggs in the young ovules and this presupposes pollination, but the causes that effect anthesis are many. In some flowers it is warmth, in others light, in still others moisture or some combination of these forces. In some plants the opening of the flowers seems conditioned on the vegetative processes of the plant, and in others, darkness rather than light produces the effect. Flowers that open in the morning may close at evening and open the next day, but those that open at night and close at dawn are less likely to open again. Many flowers, however, that close in the morning in warm weather may remain open all day when the weather is cooler. In general there is a noticeable difference between flowers that have ceased blooming and those that have closed temporarily. Usually the wilting of the corrolla indicates that blooming has finished but in a few cases this is no criterion. In the spider flower, for example, the flowers open toward evening and by mid-forenoon of the next day the petals hang limp and twisted as if ready to fall from the plant. But as evening approaches they unfold once more and appear as fresh as ever until another morning comes, when they wilt again and this time do not recover. Before the day is ended they have fallen.

A Curious Fern Pest.—Some time ago, a friend of this magazine sent the editor some fronds of the marsh fern which at first glance seemed to bear its fruit dots, or sporangia, in a broad band on the rachis. The fern is noted for producing abundant sporangia which at maturity quite cover the underside of the pinnules and it therefore seemed quite natural for it to bear sporangia on the rachis to which the pinnules were attached, but a little closer examination revealed the fact that the band of spore cases is merely the decorations, as it were, of a silken cover spun by some small but cunning larva for its own protection. The occurrence of such an insect on the ferns has apparently not before been reported and is well worth recording.

Acids in Fruits.—Even sweet fruits have some acid in them and, as everybody knows, the sourness of other kinds is due to an excess of such acids. Though there are apparently a good many degrees of sourness in fruits, the acids which cause them are comparatively few. Malic acid seems to be the principal one. It is, probably the only acid, in plums, apples, cherries, bananas, persimmons, watermelons, peaches and quinces as well as many others. In the canteloupe, lemon, orange, and pomegranate citric acid is found, while in cranberries, raspberries, and blackberries both citric and malic acids are present. In some cases one or the other of these acids is represented by a mere trace or it may disappear altogether.

A Giant Mushroom. — Among the many fine things which come to those who walk in Nature's ways, are the little surprises she holds in store for her true lovers. One does not have to go far afield, nor seek strange places to encounter them. They come like the last ounce thrown in by the generous dealer for good measure, though the full demand is satisfied without it. A trip for mushrooms across the Michigan Agricultural College grounds was rewarded recently by finding a shaggy mane (*Coprinus comatus*) so unusual in size as to quite demand record. Standing in the grass near Red Cedar river this patriarch of its kind towered to the full height of fourteen and one-half inches. The umbrella, but little raised as is the habit of these fleecy fellows, was ten inches in circumference and eight inches in length. The stem, full three and one-half inches around, stood sturdily bearing its load of a little more than a pound. Lying on a man's arm the cap covered the hand completely and the stem reached back from the finger tips nearly to the elbow. Sometimes Nature does her wonderful things in the little, the minute, and then to remind us of her command over the full range of things within her realm, she startles us with a display of her might. Whether in the great or the small there is always the perfection of the master hand—never a line misplaced, never a jar in color, never an error in proportion, but everywhere such grace and harmony as inclines her followers toward like harmony and beauty.—*H. T. Blodgett.*

Spider Flower Changing Color.—Like many another pink-flowered species, the spider flower (*Cleome pungens*) has a white variety. To find both kinds of flowers growing on the same plant, however, is something out of the ordinary and when the two kinds of flowers turn out to be the same flower at different stages of development, the fact is still more remarkable. The list of flowers with changeable color is constantly increasing, but so far as we are aware, none have been reported in which colored flowers have become white as they grow older. The cotton flower opens white and turns pink, as do the flowers of the white trillium, the Japanese honeysuckle opens white and turns yellow and several flowers, such as apple and peach, which are pink in bud may become white or nearly so in full flower, but the spider flower here noted opens a clear rose purple in the evening and by morning has become pure white. This latter color is not the white of faded flowers —the blossoms are as fresh and strong as when they first unfolded their petals. Other plants of the same species growing near this specimen do not run this gamut of color changes in blooming and the faculty of doing so seems to be an individual peculiarity. That it adds greatly to the attractiveness of the plant can well be imagined.

THE CENTURY PLANT.—There are numerous misinterpretations still clinging around the century plant, despite the fact that it is now so commonly grown. It is surprising that people so well informed on other subjects still cling to the old notion that it only blooms once in a hundred years.

It is equally surprising to many to learn that, while the plant rarely blossoms in the North, such a demonstration is not a desirable one. For the strength concentrated in that mighty floral effort, as ungainly and stiff as anything ever shown in nature, is fatal to the plant. So those who have finely developed specimens of the agave should waste no time in longing for blossoms. The main beauty, in fact, the only beauty, is in the leaves, those with variegated foliage being greatly preferable. During the summer season, this plant thrives best when kept well watered, with a weekly allowance of liquid manure or other fertilizer. In winter it should be kept in a warm, dry place and watered only sparingly if at all. The scale is its chief insect enemy. This is easily seen on the smooth, large leaves, and as readily routed with whale oil soap or any of the other standard insecticides.—*Bessie L. Putnam.*

VIOLA PEDATA.—Apropos of the editor's note on the distribution of *Viola pedata,* I find a sheet of this species collected for me by Miss Margaret R. Adams at Columbus Junction, Iowa, May 1, 1902, with the strongly contrasted petals. The flowers are 3.5 centimeters across and the leaves are lightly pubescent, perhaps better, puberulent. This is the latitude of Keokuk and adds another western state to the list of those in which this form has been found. My eastern plants have flowers about half as large as the Iowa plant. The western form is certainly a beauty.—*J. M. Bates, Red Cloud, Neb.*

EDITORIAL

The present number completes the first volume of this magazine in its new form and it is with much satisfaction that we are able to report that the new departure has been entirely successful. Our subscription list is now larger than at any other time in the history of the magazine and we therefore purpose continuing the publication substantially on the lines of the volume now closing. It has never been our aspiration to publish the long and technical articles that make up the bulk of many botanical publications. Such articles are undoubtedly necessary to explain the steps by which certain results have been obtained, but frequently the results themselves may be stated in a single paragraph. It is the design of this magazine to stand in a certain sense between the technical publications and the reader interested in general botany—to cast into readable form the results obtained and to collect the vast number of facts regarding plants which, though overlooked by the technical student, are none the less important. These latter are absolutely necessary to fill up the gaps between the larger studies and in days to come will prove their value many times. We trust, therefore, that our readers will not overlook these little things. We especially want the items which of themselves do not seem sufficiently important to make a long article. In addition, we desire photographs of anything of botanical interest, with or without accompanying text. For such matter as we can use proper remuneration will be made.

Once more we call attention to our list of permanent subscribers. This list, which is steadily growing, consists of those who consider themselves regular patrons of the magazine and who expect us to send it to them until they definitely order it stopped, paying each year when most convenient. In this way they avoid the possible loss of one or more numbers between the expiration and renewal of their subscriptions. In view of the permancy which attaches to such subscriptions, the rate to permanent subscribers is 75 cents a year. No subscriber will now be placed on the permanent list unless he subscribes for at least two years in advance at the reduced rate, though thereafter he may pay 75 cents annually as the others do. A transfer to the permanent list carries with it no obligation to continue a subscriber longer than the time paid for and we suggest that many more of our readers would find this method of subscribing both convenient and economical.

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Those who bind their magazines and wish the volumes to be of equal size are informed that the type area of the new magazine has been so arranged that it may be cut down to its former size without any loss of appearance except that which comes from wider margins.

* * *

Only a short time ago, new species of plants were described without much regard to the fundamentals upon which all good species should be based; in fact, it was seriously doubted whether there were any fundamentals of this kind. It was usually sufficient if some eminent authority thought his plant distinct enough to warrant a new name. The fascinating researches of the plant breeders into the workings of Mendel's Law, however, are rapidly changing our views upon this important question. If the scientists have not yet given us exact rules for distinguishing species, they have, at least, given us many helps toward the singling out of spurious species. When, by the proper manipulation of a certain form, other forms previously described as distinct species are derived from it, we are forced to the conclusion that the describer of such species was mistaken, no matter how eminent a scientist he is. In Bateson's "Principles of Heredity" the author well says: "One has only to glance over trays of bird skins, the portfolios of a herbarium or drawers of butterflies and moths to discover abundant 'species' which are analytical varieties of others. * * * Plenty of the characters which are now known to segregate would be far more than sufficient to constitute specific differences in the eyes of most systematists were the plants and animals in question brought home by collectors. We may even be certain that numbers of excellent species universally recognized by entomologists and ornithologists, for example, would, if subjected to breeding tests, be immediately proved to be analytical varieties differing from each other merely in the presence or absence of definite factors." It may be added that the ornithologists and entomologists have no monopoly of the naming of species that are not species. Probably the worst offenders on earth are the botanists. However, as Bateson has indicated, the tide is turning and one is warranted in assuming that the next manual of botany to be issued will list a much smaller number of species and still include all those that occur in its region.

BOOKS AND WRITERS

Nature and Culture, of Cincinnati, has recently changed its title to *The Bluebird.* It is the organ of the Ohio Audubon Society and contains considerable attractive matter relating to ornithology.

There are various ways of obtaining fame as an author. Some accomplish it in a single bound by a single book, others attain it after many years and the writing of many volumes, and still others may strike a popular chord after one or two attempts, but Dr. J. K. Small of the New York Botanical Garden has discovered a new and original way of attracting the attention of the botanical public, at least he has issued five books in a bunch which ought to have this effect. This versatile author recently brought out no less than four different floras, including a second edition of his "Southern Flora," which of itself is as big as a dictionary, and in addition has produced a book on Florida trees. This sets a mark in bookmaking that bids fair to be unsurpassed for some time.

Henry H. Saylor's "Book of Annuals" is likely to be a disappointment to anybody except the veriest novice. It is not a comprehensive treatment of the annual flowering plants such as one might perhaps expect from the title, but is a list of fifty species that are easily cultivated. Each species is illustrated with a good photographic reproduction and on a page facing this is to be found a certain amount of information regarding its cultivation and time of bloom, which ought to be gained as easily from any good seed catalogue. It is a book that no doubt will be of interest to the beginning gardener, but others will find little of value in it and there is still room for a real book of annuals. McBride, Nast & Co., New York, are the publishers.

A new book which possesses several unique features and is designed for use in the botanical laboratory, has just been issued by the editor of this magazine. It is a combined "Laboratory Notebook and Manual of Botany," space being left after each question for an adequate answer. The book is one of the very few botanical manuals issued on the "loose leaf" plan but is so bound that it may be used with its own covers if the pupil does not care to use a separate notebook cover. The volume deals with the structure and functions of flowering plants with a brief survey of the lower groups, and forms a lucid introduction to agronomy, systematic botany or a study of the spore-plants. Each study is complete in itself, but the work is so arranged that it may be extended or condensed at any point if the teacher desires. It is published by Ginn & Co., Boston, at 50 cents.

The study of the laws which underlie heredity in plants and animals and their applications to the new science of Eugenics has progressed so rapidly that even the up-to-date scientist runs some risk of being left behind in such matters. A host of investigators are at work on a variety of problems connected with Mendelism and new results are announced almost daily. Bateson's volume entitled "Mendel's Principles of Heredity," which sets forth an account of these advances, has been reprinted three times since 1909. The third impression with additions has just appeared and forms a most interesting and authoritative volume of some 400 pages. The bulk of the book is concerned with the laws underlying the heredity of color, this being the line upon which much of the work has been done, probably because of the clearness of the results to be obtained, but other features of the work have not been neglected; in fact, the book is an excellent summary of what has thus far been accomplished, with much information as to how these facts have been discovered and their bearing upon the whole subject of heredity and breeding. A number of black and white figures as well as several colored plates add illumination to the text. The book is an octavo and is published by the Cambridge University Press for which Messrs. G. P. Putnam's Sons, New York, are the American agents.

Two of the botanical Coulters—John M. and John G.—have each recently issued a text book in botany designed to form an introduction to agriculture and applied botany in general. Both books are 12mos of 453 pages and though discussing essentially the same subjects are so different in arrangement that they may be reviewed together without creating invidious distinctions. John M.'s volume is entitled "Elementary Studies in Botany" and is issued by the Appleton's; John G.'s book has the title "Plant Life and Plant Uses" and is published by the American Book Company. John M., who, by the way, is the father of John G., is head of the Department of Botany in the University of Chicago, and has previously written several works of similar nature; the other volume appears to be the first effort of John G. in this line, though not his first book by any means. "Elementary Studies in Botany" begins with microscopic and other algae and carries the thread of evolution through the Bryophytes and Pteridophytes to the flowering plants after which consideration is given to leaves, stems, roots, and the like. This sequence, though a perfectly logical one, is not, in the opinion of the reviewer, the proper sequence in which to present the facts of botany to the beginning student; in fact, this phase of botany seems everywhere to be losing ground as a high school subject, experience having shown that it is not attractive to the average student and does not leave him with much that later will be useful. Dr. Coulter, however, is a clear and attractive writer and presents his subject in a way to interest the student if he can be interested in this phase of the subject. The second part of the book is semi-agricultural with parts devoted to the soil, propagating, breeding, fruits, vegetables, fiber plants, etc. This part may appear to the practical man as somewhat academic since it tells about the cultivation of plants instead of how to do it. In "Plant Life and Plant Uses" the more familiar sequence of root, stem, leaf, flower, and fruit is taken up, preceded by a discussion of plants and plant processes in general and followed by chapters on the non-vascular and vascular plants. The whole book is cast in an agreeable and almost colloquial style that will readily find response in the minds of the boys and girls to whom it is addressed. The lists of questions which follow each chapter seem destined to greatly aid the pupil in the assimilation of the text. Both books are well illustrated and ought to run a pretty even race for popularity.

"The New Gardening" by Walter P. Wright is not, as one might assume from the title, devoted to the feats of horticultural "wizards." On the contrary, it is concerned with the latest developments in all phases of gardening: pergolas, borders, vegetables, fruits, sundials, rock gardens, the more decorative flowering plants, and the like. Though the author is an Englishman and writes for British readers the book cannot fail to be of interest on this side of the world for the subjects it discusses are those with which all garden lovers are concerned. American gardeners, however, may be warned that our climate will not permit some of the operations that are successful in England. Nor should one take up the book in expectation of finding exhaustive information of the newest forms of plants discussed. The notes are rather brief and often unsatisfactory, in fact the brevity to be noted in all parts of the book is a distinct disappointment, though possibly necessary in a volume which covers so large a field. The book is really a cursory and entertaining dissertation on present-day methods of gardening. It is published by Doubleday, Page & Co. at $2.00 net.

THE AMERICAN BOTANIST

A QUARTERLY JOURNAL OF ECONOMIC AND
ECOLOGICAL BOTANY

EDITED BY WILLARD N. CLUTE

Volume XX

JOLIET, ILL.
WILLARD N. CLUTE & CO.
1914

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Vol. 20. No. 1 Whole Number 100

THE AMERICAN BOTANIST

FEBRUARY, 1914

Smithsonian Institution
MAR 18

25 Cents a Copy; $1.00 a Year

WILLARD N. CLUTE & CO.
JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.00 a year or $1.50 for two years, payable strictly in advance. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

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SOUND BEACH CONNECTICUT

The American Lotus.

THE AMERICAN BOTANIST

VOL. XX JOLIET, ILL., FEBRUARY, 1914 No. 1

It suffices. What suffices?
All suffices, reckoned rightly.
Spring shall bloom where now the ice is,
Roses make the bramble sightly,
And the quickening sun shine brightly,
And the latter wind blow lightly,
And my garden teem with spices.
—Rosetti.

THE AMERICAN LOTUS

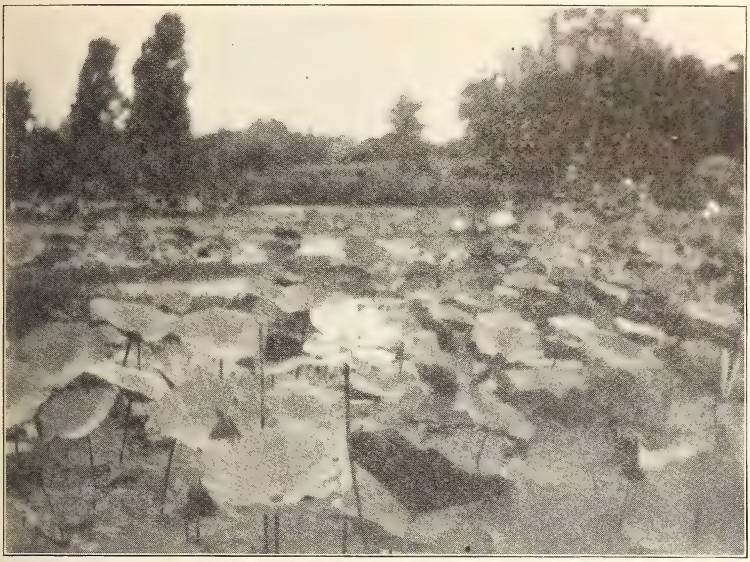
By Chas. O. Chambers.

NO plant in history, perhaps, has been invested with a larger meed of mysticism and romance than that accorded to the lotus (*Nelumbium*). Other genera than *Nelumbium* have shared the effulgence of myth and poetry associated with this name but they are not included here. Whether the sacred bean or lotus of the Nile was truly a *Nelumbium* or not it is difficult to say, now, but it seems certain that *Nelumbium speciosum*, a native of India and cultivated in the old world from time immemorial, was brought to the Nile and, under cultivation, was highly prized as food at first but later also for its beauty; that it flourished for a time and eventually disappeared from that region, leaving only its name and memory.

With the exception of its color and the shape of the anther the sacred lotus of the Orient (*N. speciosum*), is identical with our American lotus (*N. luteum*), which is yellow in place of pink and has the distinction of a hooked anther appendage. The range of this plant in America is more extensive than is commonly supposed. It has been found as far south as eastern Florida and Louisiana and as far north as the region of the Great Lakes. It has been reported native as far west as Minnesota, Iowa and Missouri and it is abundant at the present time in the swamps along the Illinois river and along the Mississippi river between Missouri and Illinois. It is also said to be abundant in the West Indies. Its natural habitat is about the smaller lakes and stagnant pools or bayous.

The more common name of chinquapin or water-chinquapin is evidently of aboriginal origin and serves to distinguish it from the chinquapin among the oaks and chestnuts. It is said that the Osage and other Indian tribes used the seeds as well as the tubers of *Nelumbium* for food and that they planted the seeds, hence the name; but their plantings must not have been very extensive or successful or the plant would be more generally distributed than it is at present. When once established *Nelumbium* holds its place and spreads more successfully by means of its rhizomes and tubers.

The flower, the largest in America, with the single exception of that of *Magnolia grandiflora,* grows singly upon a flower-stalk which raises it some distance above the water. This is in strong contrast to the water-lilies, the *Nymphaeas* which float upon the surface at the end of a long pliant stem in some species or rise only a few inches above the surface in others. The flower, resembling a "semi-double tulip" in form, opens in the morning and closes in the afternoon for three or four successive days, unless pollinated. The rich creamy yellow of the torus and stamens added to the milk-white or primrose of the petals, its large size, often reaching eight or ten inches in diameter, and its delicate pine-apple odor make it, in many respects, "the noblest flower that dedicates its beauty to the sun." The center of the flower is a seed-pod or torus, two or



The flower resembles a semi-double tulip in form.

more inches in diameter, resembling the rose-nozzle of a sprinkling can. This resemblance is heightened by the presence of about two dozen stigmas arranged in concentric circles. The stigmas are tiny knobs in the flower but in fruit are reduced to pits or crater-like openings, within each of which is a single nut-like seed or chinquapin. These become almost loose enough to drop out when dry. When ripe and dry this entire fruit, now about double its size in the flower, makes an odd-shaped rattle-box which curves over on its stem and nods toward the water. Later it falls off and floats head downward on the water and scatters the seeds as it floats, a novel method of seed dissemination. In the Orient the seeds are planted by being wrapped in a handful of clay to serve as ballast and dropped where they are wanted to grow. This was the method in vogue along the Nile in the days of Herodotus and is still practiced in India and China.

The peltate, orbicular leaves, the largest possessed by any of our native plants, at first float flat upon the surface of the water but later are raised by the growth of the stout petiole, to a few feet above the water, when they assume a salver form and sway in the wind. The upper surface, on which alone are the stomata, is covered with a delicate down on which the dew collects like tiny beads of quicksilver. It was the sight of this in the morning that made the Thibetans exclaim, "Hail, Oh, Hail the jewel of the Lotus."

The stem system, which has been carefully studied by a number of botanists, forms an extensive network beneath the slime. After the flowering season this becomes a rich food reservoir stored with starch for the next year's growth. The tubers thus formed are said to resemble sweet potatoes in taste and have been prized as food by various natives. Chariton county, Missouri, takes its name from the Chariton river, whose name, it is said, is derived from the Indian name for *Nelumbium,* where the seeds and tubers of this plant were utilized for food by the natives.

Neither the seeds nor the tubers of our *Nelumbium luteum* are likely to attain the favor in modern diet which those of *N. speciosum* enjoyed in the balmy days of the lotus-eaters

described by Tennyson and more ancient writers; nor even the favor which the latter finds in the far Eastern countries as food and for the decoration of their temples; but the richness and beauty of the flower should entitle it to a larger place among the decorative plants where swamps or shallow pools are available. It should at least be known in its wild state, in its natural haunts as one of our most showy native flowers.

UNDRAPED TREES

By Dr. W. W. Bailey.

TREES are, in their way, as distinctive and beautiful in winter as in the warmer seasons. Each, even when undraped, has its characteristic silhouette. Again, there are far more than is generally supposed that are at all times, at least partially clothed. These, while of wide distribution as to relationship, take the general name of evergreens. Most people confine the use of that term to the Coniferæ, or members of the great pine family, but a moment's reflection adds a vast number to the list of those that retain their foliage, though perhaps not their verdancy, throughout the winter. We at once recall rhododendrons, mountain laurel, lambkill, bayberries, smilaxes, certain hollies, ferns, ground pines, pyrolas, etc.

On the other hand, there are certain true Coniferæ that are truly deciduous, such as the ginkgo, or maidenhair tree, whose fruit is a sort of berry, the various kinds of larches, the cypress, etc. These wholly drop their leaves in autumn, renewing them in spring.

The immediate bark or jacket of trees is fixed and generally recognizable in its color, character of surface, and often by the kinds of mosses or lichens that dwell upon it. Take as instances the smooth, gray, mottled coat of the beech, or the peculiar ridgy surface of ash, elm or oak. The ridgy kinds of bark are so many and so diverse that a special nomenclature has been created by foresters and tree students for describing them. This takes into account the height and width of the ridges as well as the depth and shape of the circumscribed spaces between them. Again, one must note whether the projections are more or less parallel or to what degree they interlace, bisect, or cross each other. Thus we may have a diamond or triangular or checker-board pattern. Absolutely no two trees are alike in their bark and we may add that no two individuals even of the same species are alike.

XEROPHYTES

By Willard N. Clute.

It is impossible for plants to live without water, but the xerophytes come pretty near to accomplishing it. A plant that can get along for twenty-five years without fresh supplies of moisture, seems practically independent of soil water or rainfall. All ordinary plants must have a perennial supply of moisture or they die. Let the rains hold off until they have sucked the water from the soil and they wither at once, but a little thing like lack of rain does not bother the xerophyte. Its very name, in fact, means drought plant, and the fortitude with which it endures a dry season that would put our worst weeds out of business is eloquent testimony to the effectiveness of the devices for retaining water with which it is equipped. A xerophyte is Nature's last word in the conservation of water by plants.

Xerophytes are usually regarded as inhabitants of deserts, but not all the plants in deserts are xerophytes, nor do all xerophytes live in deserts. There are no deserts in which no rain falls and frequently there is a distinct rainy season during which there is sufficient moisture to enable a large number of annuals to spring up, flower and ripen their seeds before it dries up—if they are quick about it. Such plants are not to be classed with xerophytes. True xerophytes are plants that can live year after year in regions where rain falls only occasionally and where, for the greater part of each year, all the conditions of a desert are present. During the infrequent rains they manage to store up enough water to tide them over the dry seasons.

A xerophyte is Nature's last word in the conservation of water.

There are many other situations in which the conditions which make for xerophytism in plants prevail. Our Northern States in winter are essentially deserts. There is plenty of water in the soil, it is true, but locked up in the form of ice it is as useless to plants as if it did not exist. Thus we find the plants behaving as they do in the desert, growing when water is available and dying or going into a resting period at the approach of drought. The perennial plants protect themselves from completely drying up in winter by dropping their leaves and shielding their tender young cells by bark, bud-scales, down and varnish. Any spot from which the water rapidly escapes after a rain will be xerophytic. Included in this catagory are sand dunes, cliffs and the trunks of trees. The prevalence of salt or other substances in the soil-water may also cause xerophytic conditions by hindering the flow of water into the plant. Many bogs thus present really desert conditions to the plants inhabiting them. Like the frozen soil of winter, the bogs are not physically dry, but, what amounts to the same thing, they are physiologically dry.

The characteristics which make a plant most successful as a xerophyte may be placed in three groups: they must have means for rapidly absorbing moisture; they must have some way of storing the moisture absorbed; and they must possess means for preventing this stored moisture from escaping into the air again. An extensive root system is usually the means of absorbing moisture, though some xerophytes, when epiphytic, may absorb through their leaves. Storage of water may occur in regular cisterns formed by the overlapping bases of the leaves or the leaves themselves may become cisterns. Illustrations of this may be found in the wild pines and pitcher plants of tropical regions and even our own pitcher plants are now regarded as xerophytes of this type. Water may also be stored in tuber-like receptacles as in some ferns and orchids, in underground roots and stems, but probably the more usual method of storage is in certain cells of the leaf, called water storage cells. These may form a sort of water blanket enveloping the green parts of the leaf or they may be in the interior of the leaf surrounded by the green tissue.

Most interesting of xerophytic characteristics are those which are concerned with the retention of moisture. At the outset we find our plants divided into two groups: one, represented by the cacti, without leaves and performing all the work of food making by means of its green stems; the other, represented by the agave and yucca, retaining its leaves and protecting them from evaporation. While it is probable that certain leafy xerophytes, to be mentioned later, represent the most resistant types of vegetation on the earth, the cacti are eminently successful types and in a drought-enduring contest would undoubtedly outlast nearly all comers. They are admirably adapted for this by their thick and leathery epidermis, through which water escapes very slowly, by their sap which, mixed with mucilage and other gums, is slow to evaporate, but especially by their stems which tend to become cylindrical or spherical, this latter form being the one which presents the least surface for a given bulk and thus presents the least chance possible for evaporation.

In the leafy xerophytes, the leaves are seldom large and in some even these are dropped when conditions become severe. Long and narrow leaf forms are common and in certain extreme types the leaves are cylindrical with an abundant water tissue suggesting the plan after which cactus stems are constructed. Evaporation from the leaves is retarded by a thick epidermis, or by a coat of wax, hairs, or varnish. The small openings in the epidermis, called stomata, which are necessary for an exchange of gases with the outside air, and through which moisture may escape, are usually on the under, shaded side of the leaf. On hot days the escape of moisture through these may be further hindered by the leaves rolling backward and enclosing them, or the stomata, themselves, may be sunk in pits or grooves in the leaf and protected by wax and hairs. A few partial xerophytes, like our well-known compass plant and the gums of Australia, turn their leaves edgewise to the sun and thus avoid transpiration.

A region in which water seldom falls would seem to be sufficiently trying to plants, but it is not the limit of inhospitable conditions. In some deserts there is the additional handicap of strong salts in the soil. This is doubly a desert and yet Nature has fashioned a few forms that can exist even here. They are mostly plants of the houseleek and pigweed families with thick cylindrical leaves and a cell-sap of such high osmotic pressure that they can absorb moisture in spite of the salt.

Between the true xerophytes and the plants of moister regions, there are all degrees of gradation. Many plants possess only a few xerophytic characteristics, their manner and place of life not requiring a greater specialization. In tracing such structures in even our common plants and correlating them with their environment, the student of botany can find both profit and entertainment.

THE PLANTAIN LILY

By Mrs. Georgia Torrey Drennan.

IN many parts of our country the *Funkia* is known as the day lily. In reality, it is a very different flower from its near relative the *Hemerocallis,* or true day lily. *Funkia* was the name given this genus in honor of Funk, the German botanist. Despite the fact that Funk well deserved to have a plant named for him, the generic name never became popular, and the plants continued to be known by the pleasing and descriptive name belonging more properly to the genus *Hemerocallis*. Anticipating the confusion that was likely to follow its general use, Robinson, editor of "The Garden" in England, offered a prize for a suitable common name to displace the botanical name.

"Plantain Lily" was the name that won the prize. This occurred over thirty years ago, and the name has since become well established. The resemblance of the leaves of the lily to the wild plantains is so decided that the name is very appropriate.

Funkia grandiflora, the species, has pure white funnel shaped lilies as sweet as orange flowers, fifteen to eighteen in number, borne on tall scapes, each flower in the axil of a bract. It blooms steadily from July till autumn frosts. The foliage is of a lighter shade of green than that of its varieties. This plant will not fail to give satisfaction. Among gardeners it is sometimes known as *F. subcordata*.

Funkia lanceolata has the narrowest leaves of any; they are bright green, about five inches long and three inches broad, lanceolate, tapering at both ends. The lilies are pale lilac, each flower in the axil of a bract.

Funkia albo-marginata is a variety of *F. lanceolata*. The leaves are fully seven inches long and proportionately broad. Each leaf is edged with a silvery white line, constant throughout the season. It blooms earlier than the other varieties.

Funkia undulata has beautiful rich green foliage distinctly blotched with white. It blooms early. *Funkia ovata*, the blue plantain lily, has violet-blue flowers. Like other herbaceous plants, the *Funkias* are easily propagated by root divisions. Either in autumn after they cease to flower or in early spring before growth begins, the roots may be divided and the plants reset.

THE TRAILING ARBUTUS

By Adella Prescott.

JUST why the trailing arbutus (*Epigaea repens*) should be so commonly known as the Mayflower is hard to tell, for it often blooms in April and at best is only one of many to bloom in May; but one thing, at least, is sure: it is one of the few things for which the good ship Mayflower is in no way responsible, for it is a native of the New World and is so difficult to transplant successfully that even now it would be hard to establish in a new home across the sea. It belongs to the Heath family and while some of its relatives may be more valuable from a utilitarian point of view, (who, living in the great American pie-belt, will question the value of the huckleberry?) it is one of our most exquisite wildflowers, having an elusive charm that sets it apart from all others.

It is a small trailing evergreen plant with rounded leaves heart-shaped at the base and with stems bristling with rusty hairs. The small pink flowers grow in clusters and are dimorphic as to pistils and stamens and sub-dioecious—in other words are of two kinds, one having a long pistil and short stamens while the other has a short pistil and long stamens with a tendency to unisexualism. The calyx has five sepals and the corolla is salver-shaped and five-lobed, with a slender tube that is hairy within and which holds ten stamens and one pistil with a five-lobed stigma. The many small seeds are held in a five-lobed and five-celled capsule.

The flowers have a delightful fragrance that is rare among our flowers of early spring and this fragrance is often a guide to the dainty sprays that are hidden among the leaves. The plant grows in sandy woods and has a wide distribution ranging from Newfoundland to Minnesota and southward to Florida but it is so exacting in its requirements and so impatient of interference that I doubt if it really is "common" in any part of its range—certainly it is not so in Central New York, where we think it worth an annual pilgrimage to see.

I have read that the difficulty in cultivating it arises from the fact that it grows only in acid soil which, of course, all horticulturists would carefully avoid when trying to propagate an unusual plant. Whether this is really true, or whether it is simply a lime hater, I do not know, but I have never known of its being successfully grown in gardens.

THE CHINESE ARTICHOKE

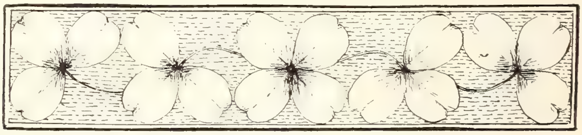
IN the popular mind, the word, artichoke, seems to stand for a class and not a particular thing. Thus we do not speak of *the* artichoke, but apply the term to a number of plants which produce bulbous or tuberous edible parts. The globe artichoke which perhaps is oftenest meant when we use the word without a qualifying adjective, is the greatly enlarged flower heads of one of the Compositae, *Cynara scolymus*. These often form globular objects three or four inches in diameter. The bracts of the involucre form the edible portion, being distended with inulin, a substance allied to starch which is very common in plants of the Composite family.

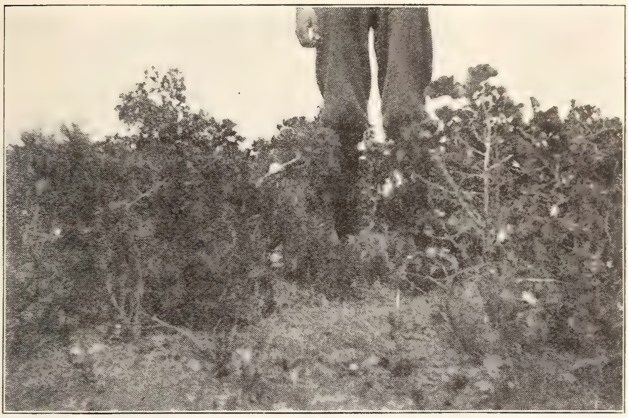
The Jerusalem artichoke also belongs to the Compositæ but the part eaten is a true tuber instead of a bud. The plant is, in fact, a sunflower (*Helianthus tuberosus*). It produces tubers nearly as large as potatoes and quite as nutritious but with a very different flavor due to the inulin they contain. The Jerusalem artichoke is usually grown as food for stock but the finer varieties may often be found in market and form no mean addition to our list of culinary vegetables.

The Chinese or Japanese artichoke, of which we give an illustration herewith, is a very different plant from the other

artichokes. It is a member of the great mint family (Labiatæ) known as *Stachys tuberifera* or *Stachys Sieboldi,* and is therefore a cousin, at least, of the so-called hedge nettles of our waysides and fence rows. Several other species of *Stachys* produce tubers but the species here mentioned seems to be the only one with tubers large enough to make them of commercial importance. Good specimens may grow to a length of four or five inches and become as thick as the finger. From six to a dozen or more tubers are borne by each plant. They are remarkable for the peculiar constrictions which encircle them at short intervals and which give to the smaller specimens a not very remote resemblance to a fat white grub.

This plant seems very little known in the United States. It is a native of China and Japan and therefore likely to be hardy in most parts of our country. It prefers a moist situation and is said to spread rapidly. Since it retails in the larger markets at from thirty to fifty cents a pound, it is likely that it will prove to be a paying crop in grounds too wet for other cultivated plants. The tubers may be left in the soil all winter or dug as wanted. They are eaten raw in salads or may be cooked in various ways. When boiled they have a distinct flavor of oysters which is even more pronounced than that of the well-known oyster plant (*Tragopogon porrifolius*) with no hint of its alliance with the mints. In addition to the name of Chinese or Japanese artichoke, the plant is known as knot-root and Japanese crowns. In the books it is sometimes called chorogi, which is apparently its native name.





AN ELFIN WOOD

THE tales brought home by travelers in unexplored lands have ever been received with some degree of incredulity. Whether they be the airy fancies of a Gulliver, the downright prevarications of Baron Munchausen, the more sober romancings of Marco Polo, the circumstantial accounts of Heroditus, or the marvellous relations of the modern globe-trotter, there is a certain element in all that requires a liberal discount before they can be accepted. If some of these gentlemen had only possessed a kodak and had pressed the button at the proper moment, they might have proved some of even their more remarkable statements.

The accompanying photograph, for instance, ought to go a long way toward proving that the country of the Lilliputians is not entirely one of Dean Swift's fancies. At least here is an ordinary man, who is at present connected with this magazine, standing in a forest of old and mature oaks and pines which do not reach above his knees. By careful examination one may see the pine cones on the plants in the left half of the picture. The oaks also are in fruit though the acorns on account of their size are not so conspicuous. Some of the trees here pictured are undoubtedly much older than the human giant in their midst.

This remarkable and interesting forest is located in southern New Jersey where it covers many square miles in the "sand barrens." The particular woodland scene here illustrated was photographed by Mr. C. F. Saunders several years ago, when with a companion he made a journey across the region. The soil is a loose yellowish sand that was evidently sea bottom not many æons ago. Its apparent lack of fertility explains the diminutive size of the arborescent vegetation. The region is practically uninhabited and the facetious natives on its borders assert that the only animal ever found in it was a land turtle who was anxiously inquiring the way to the poor house.

SOME NEW NEBRASKA PLANTS

By J. M. Bates.

On July 2, 1913, I collected a striking form of *Psoralea* which Dr. Britton says is new to their herbarium. It closely resembles *P. argophylla,* Pursh, and until it is found in fruit, will have to stand as *Psoralea argophylla robustior.*

It was found on the border of moist haylands and the sand dunes, in large beds. The whole plant is very robust, with stems 4—5 mm. in diameter, against 2—3 mm. for *argophylla.* The leaflets are five, the larger 23 mm. broad, obovate to oblong, not longer than the longest of *argophylla*—about 4.5 cm. Flowers of the same dark blue. Stipules linear 15 mm. long against 10 mm. for *argophylla.*

The plant was found 1½ miles south-west of Whitman, Grant County, Nebraska, on the Lake border; also ten miles south, in the yard of Mr. Ben. Matthewson who kindly made the second collection for me on July 15th when the plant was in full bloom. Specimens are in the herbarium of the New York Botanical Garden, the herbarium of the University of Nebraska and my own.

ELYMUS CANADENSIS VILLOSUS.

On July 20 and 21, 1911, at Loup City and Arcadia on the Middle Loup river, I collected in the brush a form of *Elymus Canadensis* with villous sheaths and upper leaf surfaces which has heretofore been undescribed. In August I found the same form in the Minnechaduga canyon at Valentine, Cherry County, where it extended for a mile in length. The villosity varies from dense to a mere border on the sheath margins, the longer hairs being 1.5 mm. long. The plants are largely of *glaucifolius* type, stout or slender and vary through all the phases of *Canadensis* with hirsute lemmas, to the scarbrous glumes and lemmas of *brachystachyus* showing that there are no well defined species in this group. In looking over my whole collection, I find the Wood Lake sheet, collected 26 miles southeast of Valentine, is the same, while Crawford, 200 miles west and O'Neill, 100 miles east, furnish the lowest limit of simply fringed sheaths. If there were any sense in it, one could make a new variety for *Canadensis* and for *brachystachyus* and perhaps for *robustus* but *cui bono?*

HELIANTHUS BESSEYI N. SP.

Growing in open beds like *H. tuberosus.* Root system not strongly tuberous, stems medium, about 5 mm. in diameter 9—10 dm. high, angled and grooved, very rough. Leaves opposite, up to the inflorescence, of medium thickness, three-nerved, scabrous above, pale with canescence below, ovate-oblong 1—1.5 dm. long, 6 cm. wide (the longest about half way up the stem) bases rounded or tapering, summit variable, acute to acuminate; petioles 2—2.5 cm. long, scarcely winged. Inflorescence dichotomous; heads 1.5 cm. wide without the rays, the latter 10—15, rather pale yellow, 3 cm. long with brown veins, puberulent. Involucral bracts mostly appressed, lanceolate, in about 4 rows, seldom longer than the heads, canescent throughout, with heavily ciliate margins, acute, the tips cuspidate. Disk flowers canescent on the lower fourth, smooth or puberulent above. Achenes 4 mm. long, gray mottled with dusky, pubescent near the summit also with a few scattered hairs. Pappus of two lanceolate awns, cansecent and splintered into sharp teeth, at least at the broadened base. Chaff canesecent at the summit and toothed. The plant comes nearest to *H. tuberosus subcanescens.*

Type specimens numbers 5384 (2 sheets), Sept. 12, 1910, and 5816½, Sept. 16, 1913. Red Cloud, Nebraska, within the city limits. Another Red Cloud sheet (No. 3361, Sept. 13, 1904,) differs in having larger leaves the upper few alternate, the bracts longer and acuminate and less canescent. It is essentially the same. The first collection, No. 1990, was made at Callaway, Custer County, 125 miles northwest, Sept. 9, 1901. It has longer bracts and narrower scales and a few more rays but is mostly like the type. I have been for twelve years trying to make it fit some description in the Manuals. Dr. Britton and Dr. Rydberg, to whom I carried it in October, 1913, say they have seen nothing like it. I have named it in honor of Dr. Charles E. Bessey of the University of Nebraska who has been my inspiration for twenty-five years.

If this should prove to be a hybrid, it would likely come from *H. tuberosus* and *H. hirsutus trachyphyllus.* The former is here; the latter I have been unable to find though attributed to Nebraska. It is not unlikely that some form of the present species has been confounded with the variety. Dr. H. Hapeman of Minden has collected on the Platte some forms that approximate the present species as well as several other evident hybrids. They will be studied intensely in the near future, as larger collections are made in full flower and fruit.

PAPER AND PAPER STOCK

FEW people realize that the preservation of our forests is strictly a commercial matter. So long as wood continues cheaper than brick, stone, or concrete, just so long will we continue to build with wood. If paper can be manufactured from wood pulp cheaper than from other kinds of paper stock, we shall continue to cut down our forests and run them through the pulp mills. The following article, taken from a papermaker's circular, throws an interesting light on the subject.

In the earlier days of the paper industry the raw materials used were linen and cotton rags, but with the growth of population and the spread of education it soon became apparent that all the rags in the world could not make a tithe of the paper supply required by man, and therefore peat, straw—bleached and unbleached—esparto grass from Spain and northern Africa, were introduced and speedily found their place as the basis of more or less expensive grades. It was not, however, until attention was called to the fact that cellulose could be obtained from wood that paper-making reached its final and greatest development. A supply of raw material was thus provided, apparently inexhaustible, cheap, and equal in quality to all but the very highest grade of rags; and thus great newspapers, magazines, and editions of books were made immediately possible for the first time.

During the past five years the acceleration in the rate of consumption has been so great as to make it apparent that no natural resource of the world could indefinitely supply the demand for a paper-making material—this in spite of the fact that the amount of wood used in the manufacture of paper is only about 5 per cent of the total annual cut. There has been in consequence an eager search instituted for other sources of supply of pulp and attention naturally turned to corn-stalks, bagasse, (the pulp remaining after the juice is pressed from sugar cane), cotton-stalks, and cotton-seed hulls. There is an unlimited supply of these substances, but each of them has some radical manufacturing defect which prevents it from supplanting wood as our chief source of supply.

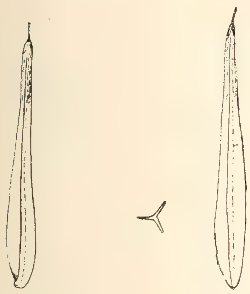
At present it would cost more per pound to make white paper from any one of them than from wood. Cornstalks, indeed, make a very good grade of white book paper, and there exists an absolutely unlimited supply compared to present consumption. This supply is, of course, renewed annually, and is a by-product of one of the world's great staple food plants. Moreover, there is a valuable pith obtained from the cornstalks which is used in calking battle-ships, and a cattle food may also be obtained at the time of making it into pulp. Why, then, cannot paper be made from this material and the destruction of our forests entirely stopped, at least so far as their use for producing paper pulp is concerned? The answer is a purely commercial one—it costs more to make this same grade of paper from cornstalks; and therefore a paper can never be made from them until the cost of wood rises above that of producing pulp from cornstalks. This will not occur very soon, as the cost of wood pulp, in spite of its alarming scarcity in this country is held down by competition in various foreign countries where wood is still very plentiful and where labor, the largest item in the expense of pulp making, is very much cheaper than in the United States.

In addition to the above must be cited the expense of assembling the cornstalks over enormously large areas as compared to wood, the extra cost for freight, and the final and fatal defect—that is, a yield of only about 300 pounds of commercial pulp from a ton of stalks, whereas a ton of spruce wood, properly manipulated, will yield approximately 1200 pounds of pulp; and this with far less expenditure of chemicals, labor, plant, and steam. The above objections practically cover the production of pulp from the other possible materials named :bagasse, cornstalks, cotton-seed hulls, and all other substances which have been offered as substitutes for pulp.

TRICARPELLARY ASH-FRUITS

By Charles E. Bessey.

FOR some years I have noticed that certain green ash trees (*Fraxinus pennsylvanica*) in Lincoln regularly bear a few tricarpellary fruits. Careful estimates show that three to four per cent of the samaras of some trees are tricarpellary instead of bicarpellary as they should be normally. The accompanying outline drawings will show what these tricarpellary fruits are like, especially the cross-section of the wing position, shown between the samaras. Occasionally I have found *two seeds* in these abnormal samaras, but this is by no means common. Furthermore I have observed that tricarpellary fruits occur only on trees with long, narrow-winged samaras, and that they are never present where the wings are short and broad.



Probably this is a case of reversion, since it is certain that in the ancestral line preceding the ashes not so very far, the pistils had more than two carpels. It would be interesting to plant these tricarpellary fruits and see whether there is any tendency toward an increase in their numbers.

ADDITIONAL NOTES ON NEW FORMS OF RUDBECKIA

By Stewart H. Burnham.

IN the November, 1913, number of the *American Botanist,* the editor published a very interesting article on "The Production of New Forms of Rudbeckia." One of the new forms, *Rudbeckia hirta* var. *bicolor* Clute was found several years ago in July, by Dr. Chas. H. Peck, the veteran State Botanist of New York, who mentions such a plant in his Remarks and Observations of the New York State Museum Report (27:30. 1894 Bot. ed. Dr. Peck says: "*Rudbeckia hirta L.* A form with the lower half of the rays of a beautiful brown color occurs at Middle Grove," Saratoga county. "Mrs. Anthony sends the same form from Gouverneur." The specimens are preserved in the State Herbarium at Albany: and Dr. Peck wrote on the label an herbarium name, calling the plants var. *bicolor,* although he never published the name.

In the Lake George region of New York, the Black-eyed Susan is known as the Yellow Daisy, and is usually considered a weed. It was probably introduced into this section about 1856 in grass-seed. Double flowered plants were found on the shores of Lake George in 1900 by the late Dr. George D. Hulst of Brooklyn: and five years later I found a plant with similar flowers at Vaughns north of Hudson Falls. During July, 1897, a curious quilled-rayed plant was found in a meadow at Vaughns: a form which might be characterized as:

Rudbeckia hirta var. *tubuliforme* n. var. Like the type, except the ray flowers are tubular, very slender, 1/3-2/3 inches long, 2-5 lobed. Type in my collection.

[It appears that Dr. Peck and the editor of this magazine are not the only ones who have been attracted by the variations of color in *Rudbeckia hirta*. As a matter of fact, such variations appear to be fairly common if one may judge from the number of people reporting them. So far as we can discover, the first mention of the forms in print was in *Meehans' Monthly* for 1891 where several notes mention the two-colored form as if it were a newly discovered variation. In 1893 Miss Florence Beckwith published in the "Proceedings of the Rochester Academy of Science" a note on the occurrence of several varieties near Rochester, New York, accompanied by a plate showing no less than seven different forms. All these, it may be of interest to note, can be matched by forms growing in the editor's garden. Miss Beckwith later listed the bicolored form in her "Flora of Monroe County, N. Y." but without name. The form has not escaped an earlier name, however, for in the "Sixth Annual Report of the Michigan Academy of Science," published in 1904, Mr. O. A. Farwell described and named the plant as follows: *"Rudbeckia hirta* L. var. *pulcherrima*. A form that differs from the species in having a part of the upper surface of the ray, or even the whole face, brown purple." In letters recently received, Mr. Farwell states that while his variety is based on the two forms recently described as *bicolor* and *rubra,* both forms being mounted on the same type sheet, he has always considered the two-colored form to be typical of the name *pulcherrima*. Since it is apparent that both forms are distinct enough to deserve being separately named, it may be well to apply the name *pulcherrima* to the form previously known as *bicolor* leaving *rubra* to stand for the brownish-red form. It may be noted, however, that both Mr. Farwell and the editor have described these plants as varieties. Should some enterprising name tinker wish to reduce them to forms, then by the absurd rules that govern such cases in botanical nomenclature, new names may be given the plants and both *rubra, bicolor* and *pulcherrima* be relegated to synonomy.—Ed.]

NOTE *and* COMMENT

Double Hepaticas.—There is probably no more variable plant in North America than the hepatica. Its flowers are of every shade of color from white to deep blue or pink and they vary as widely in the size of the blossoms and in the number of colored parts, or sepals. Moreover, though the botanical manuals record two species—*Hepatica triloba* and *H. acutiloba* —they all qualify the statement by adding that these two species intergrade and one is warranted in the inference that some of the plants are therefore neither one species nor the other. Ordinarily there are from five to seven sepals in each flower, though it is not difficult to find blossoms with twelve or more. From such semi-double flowers it is possible to produce specimens that are really double, and one nurseryman is now offering pink-flowered plants of this kind. It is likely that any given color of hepatica flowers can be very much improved by cultivation and those with a taste for such work may find here a subject for experiment already much advanced by nature. The fact that new strains may have a cash value should not be overlooked. The abundance of the hepatica in almost any locality gives wide scope for selection and further facilitates the production of new forms.

Experiments in Photosynthesis.—The time honored method of showing the evolution of gas in photosynthesis, and of securing enough of this gas for a test, consists in inverting a short-stemmed glass funnel over a quantity of aquatic vegetation in a jar of water and inverting a test tube filled with water over the stem of the funnel. As the gas is evolved it rises through the stem of the funnel and displaces the water in the test tube. This method is often quite slow, several days sometimes being required to catch a test tube of the gas. Harry B. Heimburger, of DePauw University, seems to have discovered an improvement on this method, in which, by using land plants as a source of the gas, he is able to secure from sixty to eighty cubic centimeters of gas in four hours, a much greater quantity than could be secured from water plants in the same time. The specimens which gave the best results were young shoots of the sweet clover with approximately 100 leaves, but catnip leaves are known to be nearly as good, and even red clover, wild lettuce and burdock may be used. By this method sufficient gas may be secured for a test "while you wait." When leaves of land plants are used, however, it has been found necessary to add carbon dioxide to the water. This is accomplished by placing some chips of limestone or marble in a test tube and covering them with hydrochloric acid. The gas evolved may be led into the water by means of a glass or rubber tube, care being taken to prevent the carbon dioxide from bubbling up beneath the glass funnel. The whole performance, of course, should be carried on in sunlight.

Ostrich Fern Renamed.—Some years ago, when L. M. Underwood dug up the long buried name of *Matteucia* and applied it to the well-known ostrich fern, there was considerable protest, for the plant had so long been known as *Onoclea* or *Struthiopteris* that a change of names seemed quite unnecessary. Besides, the name of *Struthiopteris* which had always before been connected with the fern either as a generic or specific designation, is usually translated as meaning "ostrich fern" and thus had a double right to stand as the name of this fern. It now appears that the fern is not to rest under the genus name of *Matteucia;* at least a still older name for the plant has been found. J. A. Nieuwland has recently shown that Rafinesque earlier named the fern *Pteretis* and if the name tinkerers are either logical or sincere, they will, of course, at once take up the new name. Nieuwland, however, seems to have some doubts of such proceedings, for he says: "Now that *Pteretis* is found to antedate *Matteucia,* we wonder whether it will be found worthy or acceptable in spite of its priority. We have seen so many cases, lately, of rejected names boasting priority since 1753 that we feel that all the much-vaunted statements of fealty to the fetich of priority are meaningless noise or waste of good type space."

New Ways of Naming Plants.—One sometimes wonders what the leaders of the "amiable science" would do were it not for the changing styles in nomenclature. Botany, however, can never be monotonous when a new way of naming plants, with consequent changes in the author citation, is invented every few years. Once it was the rule to give each distinct species two names, one generic and one specific. Plants that differed slightly from the species were called varieties and catalogued under the species, often without a distinct appelation. But just as in the business world where success in an undertaking often depends upon the utilization of the waste products, so in botany the waste left after making species, upon being worked over, has given rise to several new industries and made the workers more or less famous. First of all, the old species have been carefully re-examined to separate them from any clinging particles of botanical waste and the residue has been clarified and sorted into sub-species, races, varieties, forms, mutants, elementary species, and gardeners varieties. Even the species have been carefully refined and representatives appear as types, co-types, paratypes and some others. But the real industry arises from the lesser forms. There is now the sub-species which is regarded as pretty nearly a species and is given three technical names, generic, specific and subspecific. A variety also has three names with "var." written before the last one. This is supposed to distinguish it from a sub-species. Forms are written like varieties with "f" or "forma" before the third word, though how a form differs from a variety one searches the dictionary in vain to discover. This shows, for one thing, how much the lexicographers have yet to learn from the botanists. As a matter of fact the "form" seems to represent an entity a little less stable than a variety; that is, if we describe them they are varieties; if the other fellow names them they are forms. Recently one more catagory has arisen to puzzle us. This is the mutation usually abbreviated to "mut." Thus we read of *Oenothera biennis* mut. *lata* and the like. Practically all varieties are now regarded as being mutations, however, and in view of this fact we wonder whether it is not possible that that "mut." has lost a final t and properly belongs to the author citation instead of to the plant.

BOTRYCHIUM DICHRONUM A SYNONYM.—In a recent publication from the United States National Herbarium, Ivar Tidestrom comes to the conclusion that the form of *Botrychium* which has been named *B. dichronum* is a distinct species but that it is not entitled to the name owing to an earlier name applied to it. The writer of this note collected the specimens upon which *B. dichronum* is based and he is one of the very few living collectors who have seen the fern growing. He has examined many of the ferns in their native haunts and is still firmly convinced that the plant differs from our common form so slightly as to scarcely entitle it to be called a variety. The most noticeable difference between the rattlesnake fern (*Botrychium Virginianum*) and the so-called *Botrychium dichronum* is the possession of a second sterile frond by the latter. The writer first pointed out that this second, apparently sterile frond is in reality the fertile frond of the previous year, from which the spore-bearing part has fallen. Numbers of specimens were examined and all bore evidence of having once borne sporophylls. In this plant, as in all other herbaceous ferns, the spore-bearing parts are short-lived in comparison with the sterile portions and in warmer parts of the world the sterile parts are hardy enough to persist until a new frond is spread. This seems hardly difference enough to entitle such a plant to be considered a distinct species if the plant in question is to be called a species, it should, according to Tidestrom, be called *Botrychium cicutarium*. The writer is of the opinion, however, that it will ultimately find a place in fern lists as *Botrychium Virginianum* var. *dichronum* or *B. V.* var. *cicutarium.*

Color-Blind Bees.—The sun sends to us across the boundless regions of space, a vast number of waves of different length, but in all this number the human eye can distinguish barely an octave—some seven groups which we know as red, orange, yellow, green, blue, indigo and violet rays. Below the red rays are other rays which, though invisible, may be detected by proper means. Similarly beyond the violet rays are other rays that affect the photographer's plate, but which, so far as the eye is concerned, might as well not exist. In working out our theories of vision it is possible that we have not taken account of all the facts. With regard to insects and flowers, for instance, it is quite possible that the insects can see very different colors in the flowers from those we perceive. As a matter of fact, it is now known that bees are color blind for some of the colors we can perceive. A German scientist has recently shown that bees cannot distinguish between red and black. Experiments seem to show, also, that these insects are insensible to certain shades of blue-green which are complementary to red. Blue and yellow, however, are easily recognized. This latter fact probably accounts for the reported fondness of bees for blue flowers. In the matter of the preferences of bees for color, however, one should not proceed too rapidly. It must not be forgotten that the bee does not depend entirely upon color in hunting food. The sense of smell is known to be well developed and the bee doubtless usually "follows her nose." Nectar-yielding flowers, though concealed from sight, are readily found by bees and so are other flowers from which the showy petals and other parts have been removed.

A New Orchid Book.—Miss Grace Greylock Niles of 71 West 116 Street, New York, author of several botanical works and writer of the article on *Cypripediums* which appeared in our November number, plans soon to issue a volume on the "Native Orchids of North America," and requests notes on the species from all interested. She especially desires information on varietal forms, albinos, and new stations for rare species. In this connection Miss Caroline G. Soule calls attention to the fact that Miss Niles omitted the white form of *Cypripedium acaule* from her article in this magazine. Miss Soule says: "It was quite common in Shelbourne, N. H., last summer and several specimens were brought to me, though Gray says 'rarely white.' It was an unusually cold season there and the *Cypripediums* were blooming the last week in June."

Red Flowered Witch Hazel.—The yellow color of many flowers is known to be only a weaker form of a pigment which otherwise would make the flowers red. It is therefore not surprising to find a yellow-flowered form of a plant with normally red blossoms, in fact the yellow forms of either red fruits or flowers may be looked upon as analogous to albinos. White-flowered forms of normally yellow species are practically unknown, though there may be varieties with flowers of a dirty or creamy white. In many yellow flowers, however, there seems to be a tendency to increase the pigment and thus produce red flowers. One might almost say that we are likelier to be able to produce a red flower from a yellow one than we are to produce a pure white flower from such a form. A point is given to these observations by the fact that specimens of the witch hazel (*Hamamelis Virginiana*) have been reported in which the flowers are red. The witch hazel blooms at the end of the year when flowers of any kind are rare and flowering shrubs especially so. Even the common form is of decorative value and the red-flowered specimens ought to be doubly attractive.

GERMINATION OF THE COCKLEBUR.—The fruits of the common cocklebur or clotbur (*Xanthium*) have afforded the scientists no end of opportunities for conjecture in regard to the way the seeds germinate. In each bur there are two seeds, one slightly higher than the other, and the botanist who originally tackled the problem assumed that only the lower one grew the first year and thus arrived at the conclusion that this was a provision of nature for accomplishing a distribution of the seeds in time, by giving the species two chances for growth in any region where a fruit happens to fall. Later, another worker arrived at the conclusion that the delay in germination of the upper seed of each fruit was due to a lack of oxygen, the seed-coats being so impervious to this gas that not until decay breaks through the seed coat is the plantlet within set free. This has continued to be the opinion up to the present time, but Prof. John H. Schaffner now reports that last summer, along Lake Erie, he found an abundance of sprouting cockleburs in which both seeds had produced new plants. This is rather negative evidence, to be sure, but in a measure it disposes of the previous theories. Probably the high temperatures at which the seeds grow best has as great an effect on their sprouting as the lack of oxygen.

FERN PROTHALLIA AND DROUTH.—Although ferns are supposed to be inhabitants of moist and shady places, a large number grow on rocks where they are often exposed to the direct rays of the sun and occasionally subjected to long periods of drouth. It is something of a mystery, even to the botanist, how such plants go so long without moisture and still survive, but in most cases they manage to do it, doubtless having something of the vitality of the mosses, many of which are able to vegetate again after almost complete dessication. In the case of the fern a further complication is added to the question by the fact that the beginning or prothallial stage of the plant is a thin green scale, one cell thick, and almost microscopic in size, which in other ferns, at least, is apparently dependent upon a continuous supply of moisture. Until recently, it has been impossible to say whether the prothallia of rock-loving ferns were able to endure drying like the mosses or not since no attention appears to have been given to this phase of fern study, but F. L. Pickett has now made some experiments with the prothallia of the walking fern (*Camptosorus rhizophyllus*) which seem to prove that even this microscopic plant can endure long periods of drouth unharmed. Full grown prothallia were exposed to dry air for from one to two months and came through in good condition. That all fern prothallia are not able to do so was shown by the behavior of some prothallia of the ostrich fern which under similar conditions died after an exposure of two days. The walking fern inhabits the drier ledges of limestone rocks and the ability of its youthful stages to resist drouth has no doubt been an important factor in the occupation of its habitat.

VALUE OF NOVELTIES.—It is a mistake to suppose that plant forms are fixed or stationary. New and superior varieties are constantly appearing, often in the wild but probably more frequently among the specimens of the nurseryman and gardener since cultivation seems to have a tendency to favor variation. If the discoverer of such forms will take the trouble to preserve and further improve them, he may often find himself possessed of plants with considerable monetary value. Instances of plants that have appeared in the wild and subsequently won great favor in our gardens, have been mentioned recently in this magazine. A much longer list, beginning with Burbank's novelties, could be made of those forms that have originated in cultivation, for Burbank is only one of a great number engaged in improving plants. Any seedsman's catalogue will show many forms originated by others. In many cases these forms have appeared unexpectedly, exactly as the new forms growing wild have done, but often, also, they have been produced by crossing and in other ways. As to the value of such forms, a prominent nurseryman who has had a number of successes in this line, writes that a single novelty, the Mayflower tomato, brought him in $500, a new garden pea brought $200 and the dealer who bought it added $100 more for the privilege of naming it. Another pea, called the market garden pea, brought nearly as much. It is said that Burbank got his start in his chosen work by means of the Burbank potato which he sold for $500. Of course the dealers why buy such novelties expect to get their money back by selling the new plants at an advance in price. Almost every plant catalogue that appears has one or more pages devoted to novelties of this kind. When Pringle's American Triumph oats came out, one dealer by rapidly accumulating stock sold more than a thousand bushels at an advanced price, in Europe.

NEW FORM OF YELLOW VIOLET.—The violets have been pretty well dissected during the past decade. The 6th edition of "Gray's Manual" listed nineteen species and six varieties; the recent edition of the "Illustrated Flora" includes forty-nine species and no varieties, these latter having apparently all been promoted to specific rank. One form seems to have been missed, however. We have received from Miss Nell McMurray, New Washington, Pa., a form of the stemmed yellow violet in which the leaves are completely sessile. The species of which this is an interesting form or variety, is the one formerly called *Viola pubescens* var. *scabriuscula* but which more recently has been known as *V. scabriuscula*. We say "has been known" for we are now asked to call the plant *Viola eriocarpa*. The new form might be called *V. eriocarpa* var. *sessilis*. The name makes a handle to the plant, as it were, and will do very well for future scientists to wrangle over, so we will just tuck it away in this paragraph for the delectation of the next generation of name tinkerers. The plants are much like ordinary yellow violets except for the rather spoon-shaped leaves which clasp the stems so closely as to seem almost perfoliate.

FERNS OF THE INDIANA SAND DUNES.—In the February, 1913, issue of the *American Botanist,* Edwin D. Hull notes the finding by him of a single immature plant of the ebony spleenwort (*Asplenium platyneuron*) in Porter County, Indiana, on October 12, 1912. On the same day, the writer was in the same region with Dr. H. S. Pepoon of Chicago, and Professor Umbach and his son, of Naperville. One of the particular pleasures of that delightful day's outing was the visit to a thriving colony of ebony spleenworts. The colony was discovered by Dr. Pepoon on Nov. 11, 1911, while exploring in the vicinity of Mount Tom. The spleenworts were associated with a numerous colony of Christmas ferns (*Polystichum acrostichoides*). The specimens found were perfect, with abundant fruiting fronds upwards of 12 inches high. They were located on a north slope, and were in such numbers that no effort was made to count them. On the same day we discovered two fine plants of *Botrychium obliquum,* var. *dissectum,* growing on the roadside at the edge of a ditch partially filled with running water. We also found a small colony of the broad beech fern (*Phegopteris hexagonoptera*). Further explorations in this fascinating region will undoubtedly reveal other colonies of rare ferns, and possibly other varieties not before reported from this portion of Indiana.—*Orpheus M. Schantz.*

PINE SAP.—Indian pipes (*Monotropa uniflora*) are among the common flowers of the August woods. Usually they are pure white though sometimes tinged with pink. I have found two with a deep pink stem and bright red ovary and two fresh plants with a dull blue stem and ovary. Last summer I discovered two small colonies of pine sap (*M. hypopitys*). At first I thought they must be yellowish Indian pipes, but coming nearer, I saw instead of one, a cluster of five or six little pipe-bowls at the summit of the stem. The little ones nodded just as the big one nods when blooming. The ciliate stigma reminded me of a miniature fleabane head, with its yellow center surrounded by a fringe of fine white hairs. Another interesting feature is the fact that the terminal flower is largest and has five petals while the others have but four.—*Nell McMurray.*

Irises for Winter Blooming.—The irises with bulbous underground parts, such as the Spanish and English irises, have become in recent years part of the florist's stock in trade. Like other bulbs, they may be induced to bloom in the greenhouse, and the flowers may usually be had in the markets shortly after Christmas. The species with rootstocks instead of bulbs, however, are seldom if ever forced, probably because the plants make considerable leaf growth before the flowers appear and the grower cannot afford the time necessary for these purely vegetative processes. Some of the earlier irises, however, such as *Iris pumila, I. chamaeiris, I. cristata,* and *I. verna,* which produce their flowers almost as soon as the leaves begin to grow, may readily be brought into flower; in fact, there are few plants that will bloom with less attention. Apparently all they need is to be subjected to freezing temperatures for some time, and if they are then removed to a moderately warm place they soon produce their flowers. Plants may be dug up after the middle of December, and if watered and set in a cellar window will come into bloom in less than a month. They need not be brought into the living rooms until in full bloom. Certain strains of *Iris pumila* are strongly fragrant which gives them an added charm. The early irises multiply so rapidly that one always has a surplus that may be forced in this way. After flowering, the leaves do not become "drawn" and flaccid as with so many plants, and their cheerful green continues for a long time to give a semblance of spring to the window garden.

A New Phlox for the Garden.—For more than a generation, a silvery-lavender phlox has been known to botanists from the sand dune region south of Lake Michigan, but because of its superficial resemblance to *Phlox pilosa,* it failed to receive a name until distinguished by the editor of this magazine. The fact that it is taller, greener, later, and more floriferous that *Phlox pilosa* seems never to have been taken into consideration, though the blossoms, so different in color from those of other phloxes, have always made it conspicuous and botanists have reported it again and again. Like *Phlox pilosa* this species has shown remarkable capacity for enduring drouth; in fact, specimens dug from a dry soil and carried all day without water, with the temperature in the nineties, came through all right when planted. The plant responds readily to good treatment and when removed to the garden produces a profusion of its starry blossoms in late May or early June. The first flowers are usually in time for Decoration Day, a season when flowers of their color are in demand, and if the plant is cut back after blooming, it will produce new flowering branches until heavy autumn frosts spoil the blossoms. Recognizing the desirability of a wide distribution of the plant, the entire stock has been sold to the well known firm of Thomas Meehan & Sons, of Germantown, Philadelphia, who will offer it to the public next spring under the name of *Phlox argillacea.* The Meehans have always shown a commendable disposition to secure new and interesting plants for decorative planting and their catalogues always contain a number of species to be obtained nowhere else.

EDITORIAL

In the midst of the great activity that at present characterizes agriculture, forestry, horticulture, plant breeding, landscape gardening, and other subjects relating to plants, the science of botany, the study of the plants, themselves, remains practically at a standstill. The science has formed one of the subjects taught in all good high schools for several generations but the number of people interested in plants as plants has not noticeably increased. It is certainly a deplorable fact that on a continent containing more than a hundred million people besides Mexicans, the best botanical journals cannot command a circulation of as much as 2,000 copies. Agriculture, horticulture, and forestry we must have because they are necessary to nourish, clothe and shelter our race, but it is no credit to our intellectual attainments that the science of botany is so little valued.

* * *

All children love flowers and are interested in their habits, uses and curious forms. Why is it, then, that when they have grown up they have no taste for, or interest in, the plants? Probably it is because the high schools pretty effectually take their childish interests out of them. When one has had the dry bones of a science drummed into him for a year or so, he is usually glad to quit. It was in no jesting spirit that the small girl said she "liked everything about plants except botany." It is hoped that the dissatisfaction with the conduct of our schools so generally expressed at present may result in such adjustments of the course as to make botany foster an interest in plants instead of producing a distaste for further study as soon as examinations are safely passed. The lives of most of us are spent surrounded by plants and every intelligent person ought to be interested in them.

* * *

There seem to be several reasons why the usual high school course in botany does not give a better account of itself, but the two most important reasons are undoubtedly the high school board and the teacher. Boards of education still class botany with chemistry and physics and assume that if one can be taught successfully in a class room the others can be. When they have supplied a botanical laboratory with plenty of glassware, microscopes, section-cutters, and staining media, they feel that they have properly equipped the school for the study of plants. It never enters the heads of school directors that plants are really alive and to be of much interest to young students must be studied in the living state out of doors. People flock to our botanical gardens and public conservatories, but they seldom become excited over jars of pickled specimens or the remains of plants stuck to herbarium sheets.

* * *

The teacher of botany seems even more to blame than the school board. As a general thing he is teaching botany because there is nobody else to conduct the course. Knowing little about the subject he is totally unable to induce the school board to grant him better conditions. The botanical course still consists, in too many cases, of recitations on the terms used in systematic botany, followed by the pressing of a definite number of plant tops, identified by looking up the common names in the index to the "Manual." Is it any wonder that the student gets little inspiration from such study for further investigations? There are at least ten thousand teachers of botany in this country, but not a tenth of them subscribe for, or read, the botanical publications. And if they read any botanical book except the text used with the class, it is almost certainly a book that has been sent them, gratis, by the publishers. This is probably the gravest charge that can be brought against the teacher. Who would employ a physician who did not keep up to date in his information? Who would take a case to a lawyer who did not keep in mind the run of new laws and recent court decisions. And yet, all too frequently, we send our children to be taught by persons who regard their college diploma as a license to stop thinking. Before botany comes into its own, we shall have to have better teachers, better books, better methods, and outdoor laboratories. The study must be given some vital connection with life.

BOOKS AND WRITERS

A new monthly botanical journal with the title of *The American Journal of Botany* is announced. It will be the official publication of the Botanical Society of America and will be published in conjunction with that society by the Brooklyn Botanical Garden. The Botanical Society of America contains several eminent botanists and the magazine ought to fill a place in botanical literature not attained by other publications.

One after another the flowers of the old fashioned garden have been taken in hand by the florist and made to produce a wealth of varieties undreamed of a few years ago. Sweet peas, peonies, irises, phloxes, dahlias and many others have gone through this process and at present the gladiolus is being developed in the same way. The original wild plant seems to have been a red-flowered form of no unusual beauty, but the modern flowers are extremely handsome and of every shade of color save a pronounced blue and florists do not despair of securing this, ultimately. Enough interest in these flowers has developed to warrant the publication of a magazine devoted especially to them. This is *The Modern Gladiolus Grower,* issued monthly at Calcium, New York, which is designed to throw a strong light on the subject.

After fourteen years' work as the editor of the Nature and Science Department of *St. Nicholas,* Dr. Edward F. Bigelow has decided to combine his nature interests and will hereafter conduct a similar department in his own publication, *The Guide to Nature.* Dr. Bigelow is a live individual and may be depended upon to do something out of the ordinary in all that he attempts. The story of his founding a school of nature study at Sound Beach, Conn., is well known and we are glad to note these further activities in promoting a study of nature.

Percy E. Rowell, whose "Introduction to General Science" has had a second printing, has planned a series of four more elementary texts on the same general subject, the first of which, entitled "Science for the Fifth Grade" has recently appeared. In this book, nearly 100 topics, taken mostly from physics and chemistry, are discussed and experiments to illustrate them outlined. The reviewer questions whether fifth grade students can apprehend much of the work outlined. An intelligent teacher, however, should be able to select many that might be used, though in view of the number of other studies now being loaded on these small students one sometimes wonders how time is to be secured for the essentials. The book is published by the author at Berkeley, Calif., at 60 cents.

To one who would thoroughly understand the life processes of plants a knowledge of chemistry is indispensible. A plant is not the inert object it often appears to be; in fact, probably a greater number of chemical reactions go on in plants than in the bodies of animals. Unfortunately the kind of chemistry offered in the average school is not calculated to enable students to investigate the problems of biological chemistry, and to supply this lack, Paul Haas and T. G. Hill have brought out an "Introduction to the Chemistry of Plant Products." It may be said at the outset that the book somewhat belies its title of an introduction, for one with no knowledge of chemistry will certainly need an introduction to it. This, however, is no drawback in the book since it allows the authors to plunge at once into the more technical part of the subject. The book is divided into nine sections devoted respectively to Fats and Oils, Carbohydrates, Glucosides, Tannins, Pigments, Nitrogen Bases, Colloids, Proteins and Enzymes. The substances belonging to these groups are discussed extensively as to their occurrence, preparation, properties, reactions and mictochemical and other tests. The authors have consulted the very considerable literature of the subject and condensed the information into a form that should be of much assistance to the chemist or botanist pursuing studies of this kind. The book is an octavo of 400 pages and is published by Longman, Green & Co., New York.

If we are to believe the literateurs, the English novel was originally a three volume affair, but the honor of making a three volume garden book seems to belong solely to Abram Linwood Urban whose "Voice of the Garden" and "My Garden of Dreams," already issued form two books in a cycle of three, the last one entitled "Garden Philosophy" being in an advanced stage of preparation. Here the resemblance to a three-volume novel ends, for the books are most interesting and entertaining volumes dealing with a phase of nature that is as yet barely touched upon in America. They are not books about plants, but books filled with the thoughts which plants suggest —the kind of books that the reviewer would like to write if he took up the subject of gardens. "The Voice of the Garden" consists of five chapters and the "Garden of Dreams" has about twice as many. Both books are illustrated by photographs and by decorations made by the author's daughter, Miss Grace Lillian Urban. Such titles of chapters as Art in the Garden, One's Own Garden and My Garden In Winter, selected at random will give an idea of their scope. The publishers have given the text an appropriate and beautiful setting which does much to foster the good impression made by the author. The books are published by Thomas Meehan and Sons, Germantown, Pa. The price of each volume is $1.00.

Vol. 20. No. 2 Whole Number 101

THE AMERICAN BOTANIST

MAY, 1914

Smithsonian Institution
JUL 12 1914
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25 Cents a Copy; $1.00 a Year

WILLARD N. CLUTE & CO.
JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.00 a year or $1.50 for two years, payable strictly in advance. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

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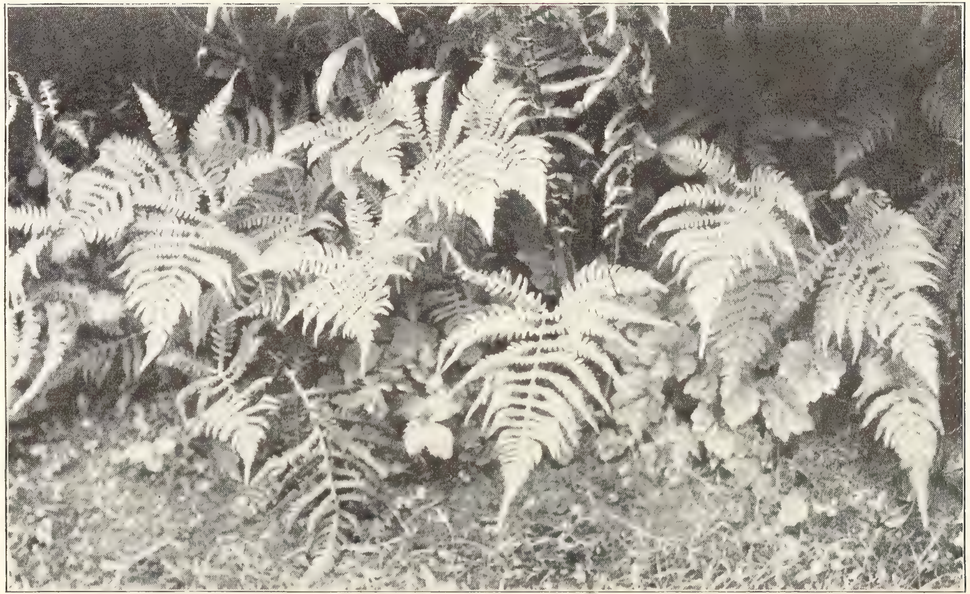


The Broad Beech Fern.

THE AMERICAN BOTANIST

VOL. XX JOLIET, ILL., MAY, 1914 No. 2

How various greens in faint degrees
Tinge the tall groups of many trees;
While careless of the changing year,
The pine, cerulean, never sere,
Towers distinguished from the rest,
And proudly vaunts his winter vest.

—Warton.

Smithsonian Institution
[illegible] 18 1914
National Museum

THE BEECH FERNS

By Willard N. Clute.

BEGINNERS in fern study usually show a fondness for those species that have sufficient individuality of form to make their separation from other species easy, and are quite willing to let the advanced students argue specific differences in groups where the species all look pretty much alike and where the decision may hang on some small difference in veining or the nature of the glands on the indusium. The maidenhair, the polypody, the cinnamon fern and the bracken are thus among the first to be known but it is usually not long before the beech ferns are added to the list if they happen to grow in the collector's region.

The two species of beech fern are at once easy to distinguish from other ferns but are themselves so much alike that to distinguish them from each other requires a rather close comparison. The student finds here an excellent exercise in separating closely allied forms without the problem being complicated by the suspicion that still other species may be confused with them. With the exception of the much larger and coarser bracken, these are the only common ferns with triangular blades. To be sure some of the Botrychiums have triangular blades, but these are not regarded as true ferns and, in any event, may be distinguished immediately by the fact that their spore cases are borne in panicles and not on the under side of the fronds. Should there be any question as to whether a given species is a beech fern or a young bracken, the method of bearing spore-cases will settle the matter, the bracken bearing its spore-cases in a continuous line on the margin of the pinnules instead of scattered on the veins at some distance from the margin.

To separate one species from the other is less easy; in fact, the beginner is seldom sure which species he has collected until he has a specimen of the other for comparison. Nature seems to have been mindful of this confusion and has facilitated matters, somewhat, by giving each a slightly different habitat. The broad beech fern (*Phegopteris hexagonoptera*) usually inhabits dryish woods while the common beech fern (*Phegopteris polypodioides*), whose vernacular name is rather a misnomer, is a lover of moist rocks and is usually to be found, when it occurs at all, on dripping ledges and in the spray of waterfalls. The margins of the two habitats overlap sometimes, to be sure, but when one finds a beech fern in shady woods it is a safe guess that it is *hexagonoptera,* while if his specimen comes from wet rocks it is pretty surely *polypodioides.*

A peculiarity of both beech ferns, but one that is most noticeable in *polypodioides,* is the way in which the lowest pair of pinnae are deflexed. They point downward and forward at a rather sharp angle which gives them a very characteristic appearance when growing. The common beech fern also carries its blade at a considerable angle to the stripe. Growing as it does on ledges and in clefts of rock the blades thus are brought parallel to the face of the cliff and are doubtless borne at the proper angle for securing the light.

In separating these two species, as in separating other ferns that are much alike, one must of course rely on smaller differences than are taken into consideration in separating one genus from another. Among the characteristics that are of value in the present instance is the shape of the frond. In the broad beech fern, this, as the name indicates, is rather wider than long; in the other species, it is just the reverse. The pinnae also, are inclined to be broader in the plant of shady woods, and they are likely to be more deeply lobed, especially the lowest pair. Both species have glandular hairs on the blade which give to each species a characteristic odor. A skilled student can almost separate the two by his sense of smell, but the novice will have to attend to all the peculiarities here given and may then have to go to the books for the technical descriptions if still undecided.

The Broad Beech Fern inhabits dryish woods.

THE MINTS

By Adella Prescott.

THE Mint family (Labiatae) is a large one and fortunately for the human race is widely distributed. It certainly has done much to make life worth living. The modern baby may be ignorant of the taste of catnip tea but his parents and grandparents know it well. It did much to relieve their infantile woes and I am not sure but the modern baby and even some children of larger growth—notably some of our eminent statesmen—would find in a bowlful of catnip tea judiciously sweetened and mellowed with cream a welcome relief from the nervous strain of social life.

As the child of other days grew older, peppermint gave relief to many a childish pain and in the form of pink and white candies brightened long and prosy sermons. Sage shared with saffron the honor of "bringing out" measles and other youthful rashes and of still another mint only a Kentucky colonel could speak in adequate terms of praise. Nor is usefulness their only excuse for being, for some of them have much beauty and pleasing fragrance.

While the mints are many and various, they are not difficult for even the amateur botanist to distinguish. When he finds a plant with square stems and opposite aromatic leaves he may quite safely decide that it is a mint. The flowers of these plants have noticeable characteristics also. They have a more or less well-marked two-lipped corolla with stamens diandrous or didynamous; that is, in pairs or in two pairs of unequal length. There is a four-lobed ovary which forms in fruiting four little nutlets surrounding the base of the single style. The calyx is usually tubular or bell-shaped and the upper lip of the corolla is two-lobed or entire, the lower lip three-lobed. The flowers themselves are clustered in the axils of the leaves or in terminal spikes or racemes. The foliage is dotted with minute glands containing a volatile oil which gives the characteristic warmth and aroma to the well known family.

While many of the species are natives of the United States, those best known, namely, spearmint (*Mentha viridis*), peppermint (*M. Piperita*), catnip (*Nepeta cataria*), and sage (*Salvia officinalis*) are naturalized from Europe, having been chosen for their virtues to accompany the Pilgrim Fathers (or more likely Pilgrim Mothers) across the sea. But the beautiful Oswego tea (*Monarda didyma*) with its showy heads of soft yet bright red flowers and strongly aromatic leaves is a native of our own meadows and many others less showy but not less interesting may be found in our woods and fields. I once found a single plant of balm (*Melissa officinalis*) which Gray says is naturalized from Europe "and sparingly escaped from gardens." It was at a distance from any dwelling and the plant was unknown in all that vicinity. It must have made its escape early and covered its tracks well.

Other members of this family are the water hoarhound (*Lycopus sinuatus*), Horsebalm (*Collinsonia Canadensis*), pennyroyal (*Hedeoma pulegioides*), and the skull cap (*Scutellaria*), the latter with violet-blue flowers growing in terminal racemes and easily identified by the curious little helmet-shaped appendage on the back of the calyx. While these are but a few of the many members of this family they are all easily identified and will serve to fix the family characteristics in the mind of the novice.

NATURE'S VACATION

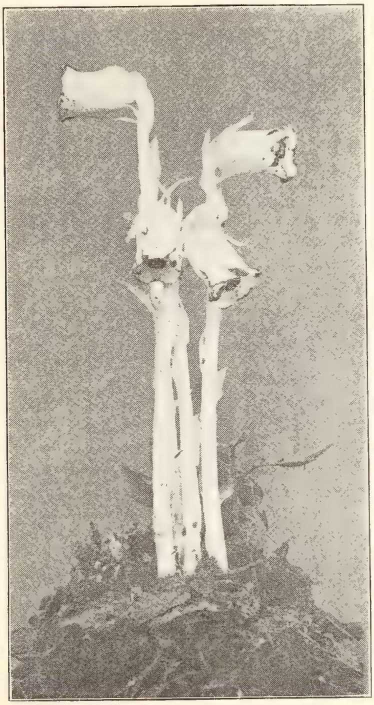
By Dr. W. W. Bailey.

NATURE, like her votaries, enjoys now and then a vacation. She has a long one, of course, in the winter, but it is not generally appreciated that she also takes one in summer. After the first onrush of spring and the high-tide verdancy of June, when every plant carries a flower, there comes a partial rest. There is never, even in winter, a total suspension of activity, but there are these periods of ease.

In the early days of August, one unused to the woods and misled by popular talk, is surprised to find few flowers in the forest. At this season, indeed, one may walk long distances through the deeper woods without detecting a blossom. Then, perhaps, he will begin to see the little cow-wheat (*Melampyrum*), a very inconspicuous white and pale yellow flower of the Figwort family (Scrophulariaceae). Small as it is, the microscope reveals in it unsuspected beauties; indeed, one of the marvels of nature is her regard for small things—her finish. The minute is as carefully adorned as the immense; an ice-crystal or a diatom as perfect as an iceberg or an Alp.

Cow-wheat, like many of its family, as Gerardia, Pedicularis, Euphrasia and Castilleja, is suspected of cladestine parasitism; that is, it feeds by its roots on other plants and at the same time puts forth its leaves with a tricky semblance of legitimate support. It is but a step from this to the saprophyte, a plant depending upon partially decayed organic matter. Such plants, it will be seen, feed upon matter already prepared by others and in a state of easy assimilation. Several like those listed above are of high ordinal relations—aristocrats that have betaken themselves to reprehensible practices.

In course of time, for some unknown reason, the saprophyte has ceased to produce true leaves. It cannot, however, entirely shake off hereditary attributes and so it exhibits in place of these, certain functionless scales devoid of chlorophyll. Its nutriment is absorbed entirely through the roots, or through peculiar organs analagous thereto. It is now more than suspected that the close relation between host and saprophyte is, at least in some cases, beneficial to the former, a relation per-



The Indian Pipe or Corpse Plant.

haps not unlike that of the nitrogen-producing tubercles to many leguminous plants.

Saprophytes, as *Monotropa, Aphyllon, Coralorhiza,* and *Epiphegus* are white or pale in color. The peculiarity is thus seen not to be a matter of family—in the above examples three orders are represented: broom-rapes, heaths and orchids—but of circumstance. Similar environment and conditions may bring about like development.

Everyone familiar with the woods knows the indian pipe (*Monotropa uniflora*). It is less commonly called the corpse plant. The application of the first name is obvious. The resemblance to a beautifully fashioned pipe is complete and wonderful. The blackening as it dries is seen more or less in most parasites, and indeed, is part of their diagnosis to the old collector. Few of our native plants are of more poetic suggestion than the indian pipe. Everyone will recall Whittier's allusion to it in his "Jack-in-the-Pulpit." The least imaginative observer feels a subtile inexplicable thrill as he finds the indian pipe in deep, dark, cool woods, haunt of the etherial thrush. There is an elusive sentiment that one seeks in vain to catch and hold. How Shakespeare's fancy would have played around it in some glorified Athenian wood. What fun Puck would have had with it. How lucid would have been Bottom's comments. We have another species known as pine-sap in which there are numerous delicate pink flowers. It is hardly as common as the other.

Akin to these plants, and blooming at the same time in similar places, are the pyrolas or shin-leaves. What infertility of resource is shown in this abominable common name applied to things so exquisite. If some of the ingenuity shown in bedeviling our scientific nomenclature were spent in coining really beautiful and appropriate common names for common things there would be hope for us. We have, however, regretfully to confess that hitherto such attempts have been worse than ineffectual. The peculiar waxy white flowers of the pyrolas and princess pines (*Chimaphila*) are especially charming. They are clear-cut, lovely things redolent of the forest. Indeed, in the case of the one-flowered pyrola (*Moneses uniflora*) the fragrance is unforgetably delicate. This plant affects deep pine woods, so that when one sees a specimen even in the herbarium he is at once led in thought to deep, dark woods like those of Franconia.

To prove that nature is but dozing in this lull period, one has but to visit some swamp gay with lilies, orchids and loosestrife or to wander by the sea-side where the banks are odorous with roses and he will note she leads a dual life. The lull is deceptive. Great things are in preparation for the gala scene of later August when the cardinals don their rich array and asters and goldenrods, joe-pye and iron-weed, clematis and ground-nut teem in swamp, wayside and meadow.

SPRAYING TO KILL WEEDS

THE use of smothering or poisonous sprays of various kinds to prevent the depredations of insects has become a matter of necessity in agricultural practice, but sprays for eradicating weeds are of more recent development. In the battle with weeds a difficulty is met that is not present when we attempt to exterminate the insects, for a weed spray must discriminate, not between insect and plant, but between good and bad specimens of the same general kind; between good plants and harmful ones.

Unfortunately it is not always easy for man himself to make distinctions of this kind. Any plant, good or bad, that gets out of bounds becomes a weed. Notwithstanding this, however, some progress has been made in compounding weed sprays that can distinguish the weeds from the crops they infest. For instance, the wild mustard, which often takes almost complete possession of grain fields, can be controlled by a spray of sulphate of iron. Our illustration shows a grain field in which a strip in the foreground has been sprayed in this way while another strip beyond has been allowed to produce its customary crop of weeds. The complete removal of the weeds in the sprayed strip will be noted.

The apparent power that sulphate of iron has of distinguishing between mustard and grain is found to be due to the covering of the two kinds of plants involved. The leaves and stems of grain are smooth and covered with a waxy powder called bloom that sheds water as any other waxed surface would do. The mustard, on the contrary, is rough, hairy, and lacks the waxy coat. When the fields are sprayed, therefore, the sulphate of iron runs off from the grain leaving it unharmed, while it remains on the mustard plants and soon causes their death.

The use of the sulphate of iron illustrates the way in which large industries find markets for their waste products. Originally the iron sulphate, which is produced in cleaning wire for drawing was turned into the rivers and streams until the steel mills were ordered to discontinue the practice. In seeking a market for the product its use as a spray was discovered and now certain mills actually manufacture the sulphate of iron since there is not enough of the by-product produced to supply the demand for it.

Sprayed and unsprayed strips of grain.

MUSHROOMS AND TOADSTOOLS

THE rambler who has never had his attention attracted by the lowly and unassuming toadstool, must be blind indeed. In summer and autumn, go where he will, in field, woodland and thicket, the representatives of this wide-spread family appear. Many people are wont to assume that out of all this host there is but one edible species, distinguished as the Mushroom, while all the others are poisonous toadstools. In fact, the idea that the possession or lack of noxious qualities divides these plants into two natural groups is very general. The mycologist, however, selects and eats many which are regarded as toadstools—one individual claims to have tested five hundred species—while the unscientific who feel confident that they can distinguish mushrooms at sight, frequently select the wrong kind and the next day furnish employment for the undertaker and the obituary editor. The majority of our species are probably harmless, but there are unquestionably many that are noxious, harmful or even deadly poisonous.

There is really no difference between a toadstool and a mushroom, unless we choose to regard the poisonous species as toadstools; but in this case we shall be scarcely scientific. The harmless and noxious species do not belong to different genera but occur side by side in the same group. Among the *Amanitas,* some species are regarded as especially toothsome, while others are among the most deadly known to Mycology.

Many rules have been put forth for distinguishing the harmful species, but all but two of them are more or less unreliable. The first is to learn to know them by their specific characteristics, just as one learns to know an elm or an oak, the second is to eat the suspected species. In the latter case, if the investigator lives, he will be safe in recording his plant as edible and harmless. The novice should be cautioned against eating any species of whose identity he is not absolutely sure. It may be reiterated that the proportion of poisonous to harmless species is relatively small, although the former often make up in numbers what they lack in species. It is a curious fact that while the unwholesome species produce their effects within a short time, the really deadly ones do not begin to operate until from eight to fifteen hours after they are eaten—by which time they may have been nearly forgotten, and the sufferer may thus fail at first to connect cause and effect. The development of the trouble is then rapid and no time should be lost in sending for a physician. Even at this stage there is an antidote for the poison in atropine, itself a deadly poison. It is administered in subcutaneous injections.

There are not a few people who would scarcely regard mushrooms as plants. Their lack of leaves, true roots, green coloring matter, etc., seem to make out a good case against them, but with all this evidence, one would still be disinclined to call them animals, although they possess the animal-like characteristic of requiring ready-made or organic food, and are unable to obtain sustenance from the earth, air and water, as ordinary green plants do. They are therefore reduced to the position of scavengers, living upon other plants, and animals, dead or alive. Mushrooms belong to the flowerless division of plants, of which the ferns are among the higher types. Their place in the line of relationship is below the ferns, below the mosses and liverworts, almost at the foot of the ladder of plant evolution in fact. Their nearest allies are the seaweeds and the green scums that are often found in freshwater pools. By many they are supposed to be degenerate offspring of the higher seaweeds. Like all the flowerless plants, they have no seeds but are propagated by spores which serve the same purpose. A spore falling in a proper situation for growth, soon gives rise to a tangle of threadlike structures which forms the body of the plant. This substance made into bricks and dried, is the mushroom "spawn" sold by the dealers. At intervals little rounded knobs form upon the mushroom threads and later develop into the familiar umbrella form. If the "spawn" is exposed to unfavorable conditions, it is said to be able to wait for years for a chance to fruit. The mushroom, it may be said, is only the fruiting part of the plant, comparable in a general way with the flowering spike of the century plant, although not homologous with it. On the underside of the umbrella-like cap are numerous radiating plates called gills which support the structures on which the spores are produced. By cutting off this cap and laying it, gills down, on a clean piece of paper, there will be produced in a few hours a "spore-print" in exact duplication of the arrangement of the gills, and due to the shedding of the numerous spores. Usually the spores are of the same color as the gills, although in some species they are not.

The mushrooms are classed with the higher fungi. Among their poor relations are numbered the rusts, smuts, blights, mildews, molds and bacteria. The puff-balls and morels are also nearly related. Although so low in the scale of plant life these constitute a very respectable part of the vegetable kingdom, since more than forty thousand species have been described.

There are about two thousand species of mushrooms in America. Some of these are known from only a single state, while others are distributed throughout. Formerly all were classed in the genus *Agaricus,* but owing to the differences which exist in such a multitude, they are now placed in five groups according to whether their spores are white, pink, yellowish, brown or black. Each of these groups contains one or more genera. The student who turns his attention to this assemblage of plants will find a greater diversity of characteristics than he might imagine from a cursory examination. In color it includes species with scarlet, violet, yellow, green, orange, white, brown and gray caps. In texture they are leathery, tough, brittle, fleshy or watery. Some are tasteless, others are bitter, peppery, mealy, or with a nutty flavor. In odor some are repellant while others have various pleasing odors "like ripe apricots," anise, etc. The genus *Lactarius* is peculiar for having a milky juice that in different species is white, orange or even blue. This juice is often acrid. In one species it is so much so that it is said to sting a tender skin like nettles.

In spite of the dangers that hedge round the pleasures of the mycophagist—as the mushroom eater likes to be called—these plants have been used more or less for two thousand years. The people of China, Italy and France are among the chief consumers of mushrooms. It is said that the city of Rome now uses about thirty tons annually. When a person speaks of *the* mushroom, *Agaricus campester* is the one usually meant. It is the commonest species in cultivation and is also abundant in the wild state being found in pastures and other grassy places but seldom if ever in the woods. The cap is usually white and the gills at first a beautiful pink, changing later to brown.

EVENING PRIMROSES

THE publication of DeVries' "Mutation Theory" gave considerable prominence to the evening primrose family, for it was with one member of this group that many of the results detailed in the book were obtained. The commonest species of eastern America (*Oenothera biennis*) is a familiar weed along roadsides and in other waste grounds whose yellow flowers open in the late afternoon and close the next morning. There is great variation in the size of the flowers and one form with flowers much larger than usual has been named *grandiflora*. It is probably this form, or one closely resembling it, that DeVries found in Holland and used in his experiments in the production of new varieties. This form grows naturally in some of the Southern States and since it achieved prominence in the plant world the seeds have been offered by florists.

One of the interesting things about the common evening primrose is the rapidity with which the flowers expand. The whole act of opening may be witnessed in the course of two or three minutes if one selects just the right time of day for his observations. A few minutes before the flower uncloses, the bud may be seen to expand until the pressure on the enclosing sepals is sufficient to cause them to separate and snap backward in the position they occupy when the flower is expanded. This movement is usually sufficient to shake the petals open but if not, they at once spread out with a motion that is quite noticeable. Few people have ever seen a flower actually open for in most cases the process is so slow that it requires very careful watching to note any progress, but in this plant there is no difficulty in seeing the whole process.

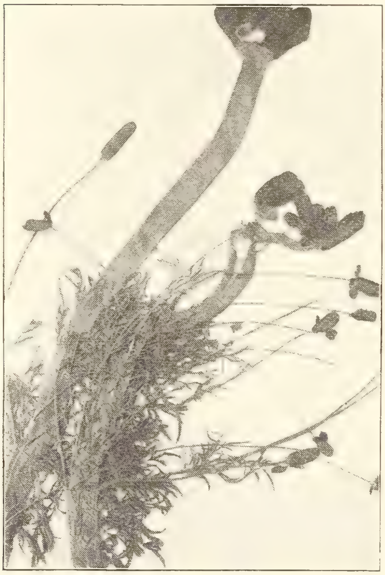
In many parts of the Northern States, there is another yellow-flowered species known as sundrops (*Oenothera fruticosa*). It has deep yellow flowers that belie the name of evening primrose by opening in the morning and remaining spread throughout the day. It is a perennial and is well worth cultivating in the flower garden. Many of the western species in this group have white flowers and are also day bloomers. This is true of *Oenothera pallida* in which the blossoms are three or four inches across and produced in great profusion for a month or more in late spring. By the middle of the afternoon the flowers close and a new set take their places the following morning. This plant will grow in any kind of soil and is not much harmed by drouths. Like the other members of its family it is a lover of the sun. Even the night-blooming species prefer to grow in full sunshine.

Blossoms three or four inches across.

A species with still larger flowers is *Oenothera speciosa.* This is a plant of the plains with flowers that open late in the day and close the next morning. It is often found in cultivation and appears to be the parent of some of the forms offered as new creations by the plant breeders. There are numerous other species of *Oenothera* widely distributed in the United States and several have rather showy flowers, but those mentioned in this article are probably the best for cultivation.

FASCIATION

THE term fasciation is given to a condition in plants in which several stems become bunched together and flattened out into a ribbon-like object. The condition may be found in ordinary vegetative stems, but it appears to be most common in the flowering parts. It is known to occur in a large number of different species and probably may occur in any plant when conditions favor its appearance.


A fasciated cone flower.

Fasciation is very common in the flowering stems of the dandelion. Scarcely a season passes in which such abnormalities may not be noticed. The flattened part in this plant may become an inch or more wide and the flower head may assume correspondingly monstrous proportions. Along with fasciation there often goes a condition known as split stem in which there seems to be a failure of the stems to unite for their entire length. In some of the rudbeckias the apex of the fasciation often breaks up into several stems each with its own flower-head or the stems may be fasciated below, split in the middle, and united again at the top, producing a multiple flower-head.

In this connection it is interesting to note that the cockscomb (*Celosia cristata*), a familiar plant of old fashioned gardens, is an excellent example of fasciation that has practically become permanent. The abnormality has been cultivated for so long and the seed so carefully selected that it now comes true from seed. In several other species of plants in which fasciation occurs spontaneously, DeVries found that thirty per cent or more of the seedlings produced the peculiarity.

Our illustration shows an interesting example of fasciation in a western species of cone flower, *Lepachys columnaris.* In this, two bundles of stems are fasciated while a number of single stems afford opportunities for comparison with the monstrosity. The photo from which the illustration was made was received from Mrs. S. B. Walker of Denver, Colorado.

CULTIVATING THE SPIDER FLOWER

By Mrs. S. B. Walker.

THE spider flower (*Cleome serrulata*) a relative of which was so interestingly described in a recent number of the *American Botanist* also deserves great praise for its adaptability in the hands of the gardener. Its odd blossoms of rosy purple are pleasing to the eye even when coming up among other plants and growing as best it may, but when planted where one wishes it to grow and cultivated and trained into shape, there is no reason why a single plant should not bear hundreds of blossoms instead of the dozen or so which it commonly produces.

Clusters nearly as large as those of the snowball.

The accompanying photograph of a single plant will show what can be accomplished in this direction. This specimen was more than five feet high and bore several hundred blossoms in clusters nearly as large as those of the snowball (*Viburnum*). The stalk of this plant was an inch and a half in diameter at the base. For an annual this is doing pretty well.

It is said that the blossoms can be made light and delicate in color in one plant and deep and dark in another by withholding or adding iron to the soil. If other than its natural form is desired, the shoots for some distance from the base may be pulled off as soon as they appear, leaving the flowers to come out at the top of the stem in bouquet shape. Following the methods of the chrysanthemum grower, extremely large clusters of bloom may be had if too many blossoms are not allowed to develop.

PALESTINE FRUITS IN CALIFORNIA GARDENS

SOUTHERN California, particularly on its rural side, has numerous features that remind the visitor of Palestine, and as one travels the sunny highways and byways of the state, he sees in field and garden many a fruit unknown to cultivation on the eastern side of our continent, though familiar enough through the reading of Scripture.

After the winter rains have brought out the verdure upon the soft, round hills, we like to hitch up the family horse for a jog among the ranches that lie in the undulations of the foothills on the outskirts of our little city. The meadow larks make music from every fence post; there is the exquisite fragrance of early orange blossoms in the air; bees are droning in the warm sunshine and plundering the sunflowers, which here in southern California bloom winter and summer. Far away among the hills, already white with the bloom of the wild lilac, the quail is calling to his mate; and plowmen with teams of six or eight horses are turning up the soil for the barley-sowing.

That glowing hillside just ahead of us owes its color to the bare, ruddy twigs of an orchard of apricots, a tree very common in California and believed by many scholars to be the apple of Proverbs and Solomon's Song. Topping the hill we descend into a little valley where, though it is still January, an orchard is in full bloom—a dainty cloud of pink and white resting lightly upon leafless branches. This is the almond, so frequently mentioned in the Old Testament, of whose wood the budding rod of Aaron was made. It is the earliest of fruit trees to blossom, and because of its haste its young fruit is apt to be nipped by frost unless it is grown in an absolutely frostless place. If we pass this way in summer we shall see the almonds hanging amid the leaves, in shape and look like lean green peaches. The pulp of the almond fruit, however, instead of being juicy and edible as is its peach cousin, is thin and dry, and at maturity splits open, disclosing the nut which is so well beloved at all our feasts.

On these midwinter days we see the vinedressers busy among the grapevines, pruning them back. The grapes of southern California vineyards are not of the sorts cultivated in the eastern states—such as the Concord, the Delaware or the Niagara, all of which are developments of native American species—but are of the quite different old-world stock, known to botanists as *Vitis vinifera.* It is abundant throughout Palestine, and of it was probably that famous cluster which the Children of Israel cut down in the valley of Eshcol. Each vine of these old-world grapes, instead of being trained high over trellises as is the case with our eastern grapes, is cut back annually to within a foot or two of the ground. Each year adds to the girth of the stumps which in old vineyards look like the stumps of small trees. A southern California vineyard, after its winter pruning, dotted with hundreds of beautyless stumps, is a scene of desolation as great as the burnt vineyards of the Philistines must have been after the fire-bearing foxes of Samson had overrun them. In the late summer and autumn, however, they are very beautiful and interesting—heaving lakes of green upon the sunny hillsides, disclosing amid the leaves great clusters of purple and white fruit.

Another characteristic Bible plant abundant in southern California is the olive. The oldest olive orchard in the state was planted by the mission fathers at the old Franciscan establishment near San Diego, and one finds about all the old mission remnants of olive yards which are said to have been started from cuttings obtained from the San Diego mission. The universal presence of the olive in the southern California landscape does much to give to the region its Old World look and to bring to mind the beautiful imagery of the Old Testament, as one travels amidst the spreading beauty of the trees. They have a peculiar ashen-gray foliage, persisting throughout the year, and producing a marked character that causes them to be readily recognized even at long distances. Bible readers will remember that the foliage of the olive brought to the ark by the returning dove is the first green thing that is named after the waters of the Noahian flood had begun to subside. The ripe fruit is a bright, glossy black in color, and Californians with a penchant for practical jokes like to tempt strangers to take a bite of it. The taste is intensely bitter and astringent, and one wonders at the genius of the man who originally discovered its edibility. The birds like the fruit when it is dead ripe and doubtless find it as pleasing as the wild cherry is to their eastern cousins. Properly pickeled the ripe olive is delicious and nutritious, and by most Californians is preferred to the pickeled green olive.

Quite as abundant in our Land of Sunshine as the olive is that other biblical fruit tree, the fig—one of the most ancient and beautiful trees, which like the olive was introduced to our Pacific Coast by the Franciscans in the eighteenth century. Old trees two feet in diameter are to be seen in California, and one who plants a fig in his garden does well to set it where its branches may have uninterupted growth for a radius of twenty feet all about it. Once we stayed for a day at a rancher's dwelling where close to the house an old fig tree grew, whose ample spread of dense foliage was as impervious to the sun as a shingled roof, and throughout the hot, rainless summer the family utilized its cool shade for a dining hall and living room, furnishing it appropriately with table and chairs. They were pleasant meals we ate there, and brought a realization of the peace and security which the ancient Hebrews associated so particularly with dwelling under one's own vine and one's own fig tree.

The commonest fig of the southern California countryside is of the black mission stock brought in by the Spanish padres, but its fruit does not dry so well as the Syrian or Smyrna fig which is of comparatively recent introduction. The dweller in a land of figs, however, does not wait to have them dried before eating them; he plucks the fresh fruit when ripe, peels back the outer skin and eats the rosy, seedy, pulpy interior immediately. It possesses a mild, sweetish taste which to most palates is pleasant enough without any addition, but at the table it is usually served with cream and sugar. That the Israelites of old must have had a fondness for the fresh fig is attested by that figure of the prophet Nahum: "All thy fortresses shall be like fig-trees with the first-ripe figs: if they be shaken, they fall into the mouth of the eater."

The pomegranate is another typical Old Testament fruit that thrives well in southern California. The Spanish settlers of southern California had an oriental fondness for the pomegranate, and it grows in all old-time gardens, the glossy green foliage lighted up in early summer with the brilliant scarlet flowers and the branches loaded in autumn with the rusty-orange, hard-husked fruit. Often the plant is set in hedges that line the highway, and at times neglected bushes of it are found growing solitary by a road which has been cut through some old rancho. The exceeding seediness of the pomegranate is a drawback to the enjoyment of it, and most Americans are in too much haste to devote time to its consumption. Its thin, watery pulp, however, has a peculiar quality especially grateful in a warm climate, and the wonderful colors of its lovely, crumpled petals and of the fruit appeal to the sense of the beautiful in us today as strongly as they did to the ancient artists who sculptured its forms upon the temple of Solomon and embroidered them into the hem of Aaron's priestly vestment.—*C. F. Saunders, in Forward.*

NOTE *and* COMMENT

Delayed Flowering in the Witch-hazel.—The witch-hazel is well known as a late bloomer, but last year I found a few plants in which some of the flowers appeared unusually late. December 29, 1913, at Glencoe, Ill., I found a number of plants on which appeared many flowers in all stages of development from unopened buds to withering petals, while other flowers on the same plant had bloomed at the usual time, at least a month previous, only the persistent calyx being in evidence. The plants were observed about noon, when the temperature registered 33°, or very little above the freezing point, yet many buds could be seen opening. Brought into the house most of the buds fully opened within two days, some within one. The flowers were normal except that the petals were somewhat shorter than ordinary. All the plants were badly infested with galls. The cause of the late flowering was no doubt due to lack of nutrition earlier in the year owing to the presence of the galls, only the flowers more favorably situated opening at the usual time. The specimens before me show that on the badly infested twigs all the flowers are the later ones, while on slightly infested twigs the later flowers are only those nearest the galls, or they may be absent. It would seem that the later flowers were only able to open after the death of the galls, which had heretofore used up the available food, when some nutrition could be obtained by the unopened buds during a slight resumption of activity at an increase of temperature to above the freezing point. Granting that some of these unopened buds survived the winter, it is quite conceivable that spring flowers could be found, but I have not been able to take a trip to find out of such is the case.—*Edwin D. Hull.*

The Mutation Theory a Myth.—During the past decade, no phase of botany has received greater attention than the mutation theory of DeVries. In brief, this theory accounts for the origin of new species by the occurrence of sudden leaps or mutations from existing species, in contradistinction to the Darwinian theory which assumes a slower and more gradual variation from existing forms. Both theories are based on the idea that plants vary from the normal and differ chiefly in the length and number of the jumps or mutations required to make the new form a species. DeVries stands for a single long jump, Darwin for a succession of shorter ones. Much plausibility has been given the theory advocated by DeVries by his production of new forms from that form of evening primrose known as *Oenothera Lamarckiana* but Prof E. C. Jeffrey writing recently in *Science* claims that *O. Lamarckiana* is a hybrid. The great trouble is to decide what are and what are not hybrids. The old test for a hybrid was its sterility. If completely sterile it was considered as certainly a hybrid. Hybrids, however, are now known to be of various grades of fertility. A great number of crosses between different species have been made and as the plants crossed differ in the degree of relationship, it follows that various grades of sterility may exist. Jeffrey gives it as his opinion that hybrids may always be identified by the fact that the pollen grains are more or less abortive and infertile. Judged by this test, the plant with which DeVries made most of his experiments is a hybrid and Jeffrey insists that in consequence the mutation theory has no standing in court and should be relegated to the realm of myths. It may be said, however, regardless of the merits of the new theory, that the discussion of the subject has had a tremendous influence on the production of new forms by breeders and this much at least must be set down to its credit.

New Paper Stock.—To make the paper for a single issue of the large daily newspaper, the pulp made from the timber in four or five acres of woodland is required. When all the books and papers printed on wood pulp paper are considered the enormous daily consumption of our forests becomes apparent. This demand for wood is also constantly increasing. The favorite wood of the paper-maker at present is spruce, but the waning supply of this wood has caused the manufacturers to look about for other woods that will take its place. One of the promising sources of wood pulp in the future seems to exist in trees of the national forests that are of little use for timber. The principal problem at present is to economically work up such stock. The investigation of the subject is being carried on at the Government laboratory at Wausau, Wisconsin.

Soap From Plants.—That many plants, or plant parts, will form a lather when rubbed up in water has long been known but only recently has this fact taken on much commercial importance though soap bark has for many years formed part of the druggist's stock in trade. According to *Science,* the settlers in Western Kansas are now cutting the yucca (*Y. baccata*), known locally as Spanish bayonet and soap-weed, for sale to the soap makers. The plants when dried and baled bring about eight dollars a ton delivered to the railway and it is said an energetic man can make fair wages at the business. The plants are used in making toilet soaps for which purpose they are said to be especially valuable since they contain no alkali.

Changing Values in Botany.—It was Linnaeus "the Father of Botany" who declared that the only worthy task of a botanist was to know by name as many species of the vegetable kingdom as possible, but the world has moved a long distance forward since his day. In the beginning, any science must deal largely with classification and description, but such work is merely a means to an end. In order to deal further with a specimen its name and external characteristics must be known. After classification comes studies of the internal structure followed by investigations of function, environment and inheritance. Although the mere naming of plants belongs to the elementary stages of botany a large number of our botanists have never gotten beyond it and many probably never will. To them a new species bulks larger than any fact or principle of ecology, physiology, or evolution. The more advanced thinkers, however, have gone on to studies of ecology and genetics and though these should logically follow one another they have been taken up so nearly simultaneously that they have been somewhat telescoped. A writer in *Science* dubs work in naming plants "Manual labor" and rejoices that the botany of the schools is no longer a half year's study of Gray's manual followed by a second half year of the same kind. It is rather early to rejoice, however. A large number of schools still do very little except "analyze" plants and the botanizer is seldom interested in anything else. As a class, the people interested in plants have not discovered that the days of the pioneer are past.

VARYING RUDBECKIAS.—Miss Caroline Grey Soule writes: "Let anyone working up *Rudbeckias* go to Vermont. I have found the variety with brown on the lower half of the rays, the double flower and the quilled rays in single and double flowers, some much like *Dahlia* in form. All have been found in nine summers at Brandon, Vermont, and the first three forms at Tyson, also." It often happens that a plant in a new habitat produces a greater number of new forms than it does in its original home. This is probably due to the efforts of the species to adjust itself to new conditions. Wild flowers removed to cultivation act in a similar way. *Rudbeckia* is an immigrant in Vermont. Probably its endeavors to conquer the country accounts for the variations observed.

WATER PLANTAIN IN SOUTHERN CALIFORNIA.—Last August I found quite a colony of the water plantain (*Alisma* *plantago-aquatica*) on the Pacific Electric right of way, about half way between Los Angeles and Long Beach. I am told this is the first record for this plant in Southern California. I also found a plant of *Lepidium perfoliatum* on a hillside north of Los Angeles. Dr. A. Davidson found a few plants in Hollywood in 1910, but it is not common.—*George L. Moxley.*

RUDBECKIAS AND MOISTURE.—Miss Nell McMurray observes that black-eyed Susans (*Rudbeckia hirta*) belie their sturdy looks in one sense: one must hurry home after gathering them because they soon wilt and once wilted water will not revive them. This peculiarity is not confined to *Rudbeckias,* however. A large number of plants that seem able to withstand almost any amount of dryness when rooted in the soil, quickly wilt when severed from their roots. We expect such behavior in water plants since they are generally so adjusted to a watery habitat that they possess no means of retaining the water in their tissues and, indeed, do not need such adaptations in their habitats. But in the plants of dry regions provision for retaining moisture is necessary, and it is a surprise to find in such a habitat plants that wilt so easily. The reason for this might furnish a problem worth solving by one with the time for the work.

VARYING WEIGHT OF LEAVES.—That a bushel of leaves picked from a tree in spring weighs less when dried than a bushel of leaves from the same tree picked in autumn is well known. The increase in weight is due to the accumulation of mineral matter in the leaf during the summer. A similar difference has been found by our government experts to exist between the weight of leaves picked from the plant and dried and the weight of similar leaves left to dry on the plant. In the process of drying, part of the substance of the leaves is withdrawn into the stem when they are left on the plant. Since the loss of weight in leaves dried on the plant is often twice as great as the loss in picked leaves this fact assumes some commercial importance when it concerns a crop, such as tobacco, which is sold at a good round price per pound. If the tobacco grower picks the leaves from his plant and dries them instead of cutting down and drying the plant in the usual way, he will have possibly fifteen per cent more tobacco by weight. The question as to which procedure is the best depends entirely on whether the added weight will produce enough revenue to pay for the extra cost of handling in the new way and leave a profit over, but it is the solution of such problems as these that make all the difference between automobiles or Fords for Uncle Silas.

Udo.—Udo is a Japanese plant of the ginseng family known to botanists as *Aralia cordata* and therefore closely related to our pettymorel or wild spikenard (*A. racemosa*). It is not unlike our own species of *Aralia,* and has been used as a spring vegetable in Japan for a long time. The young shoots are blanched and eaten much as sea kale (*Crambe maritima*) is with us. For some years the United States Government has been endeavoring to introduce udo into cultivation, but thus far with indifferent success, possibly because the flavor is somewhat different from that of the other vegetables which we use in a similar way. Eaten raw the stems have a faint suggestion of turpentine and a liking for the plant may have to be acquired. The flavor, however, is no more pronounced than that of parsnip, or celery, and cooking is said to improve or modify it. Udo is somewhat larger than the wild spikenard and sometimes reaches a height of ten feet. Like our species it is an herbaceous perennial and dies down to the earth in fall. When the young shoots appear in spring they are blanched by heaping the soil around them or covering them with drain tiles. The edible portions are from twelve to eighteen inches long and nearly an inch and a half thick. Though the plant is but slowly becoming known, it is said to be steadily growing in favor and a few truck gardeners are now growing it on a commercial scale. One of its advantages is that it is ready in spring before most other garden crops are mature. Only sea kale, asparagus and rhubarb compete with it.

THE DUCK POTATO.—Botanists perfectly familiar with the various species of arrow-head (*Sagittaria*) may perhaps fail to recognize the species under the vernacular name of duck potato, but to hunters and trappers the name carries more significance. The plant that usually goes by the name is a common species of the Mississippi delta, but it also occurs from Texas to Alabama and northward almost to the Great Lakes. The potatoes, from which the plant gets its common name, are produced on runners from the base of the plant. They are globular in shape and may become an inch in diameter. Wild ducks are very fond of them. The gullet of one canvasback examined contained twenty-four entire tubers and the remains of several more. Two other species of Sagittaria—*S. latifolia* and *S. arifolia*—produce similar tubers though few botanists appear to be familiar with them. These latter species are distributed nearly throughout the United States and being more widely known have acquired a variety of common names. Among these may be mentioned wapato, Chinese onion, water nut, and swan-, duck-, muskrat-, and swamp-potato. The tubers of *Sagittaria latifolia* may become two inches long and more than an inch in diameter. From six to nine are often found on a plant. A bulletin from the United States Bureau of Biological Survey calls attention to the value of these plants in attracting and providing food for waterfowl. The plants are easily established in regions where they do not naturally grow, either by means of seeds or tubers, though the latter are said to give the more satisfactory results.

DEATH OF DR. W. W. BAILEY.—Dr. William Whitman Bailey, well and favorably known to all readers of this magazine through his frequent contributions to its pages, died at his residence in Providence, R. I., February 20, 1914, at the age of 71. Dr. Bailey was the son of Prof. Jacob Bailey, and was born at West Point on February 22, 1843. He entered Brown University in 1860, but withdrew in 1862 to become a private in the 10th Rhode Island Volunteers. He returned later to Brown and was graduated. Upon his graduation he became assistant in chemistry at the Massachusetts Institute of Technology and the next year was appointed botanist of the United States Geological Survey of the 40th Parallel. Later he studied botany in Columbia and Harvard Universities and in 1877 became instructor in botany in Brown University. Four years later he became full professor of botany in the same institution and this place he held until 1906 when he retired as Professor Emeritus. Dr. Bailey was a member of many scientific and other societies and was frequently selected for positions of honor in them. In addition to being the author of many short articles on scientific subjects published in a variety of magazines, Dr. Bailey produced several books, the best known of which are "Among Rhode Island Wildflowers," "New England Wildflowers," "The Botanical Collector's Handbook," and "Botanizing." His last volume was a collection of his poems published in 1909. Dr. Bailey had a philosophical and humorous way of looking at common things that made his observations always of interest. He was ever ready to help those who were interested in his favorite subject and there are few of the present generation of botanists who do not owe him a debt of gratitude on this score. He belonged to a group of students who began their studies before the microscope and the scalpel became the chief tools of the botanist and ever derived the greatest pleasure from the contemplation of the living plant instead of its dried and sectioned counterpart.

VIOLETS BUT NOT VIOLAS.—If a recent student of the violets has his way, there is not likely to be much left of the genus *Viola* to which we have heretofore regarded these plants as belonging. As every one knows, the violets may be blue, lavender, yellow, or white in color, may have cleistogamous flowers or not, may possess aerial stems, or grow from a half subterranean stem known as a rhizome. These differences give the systematist a chance to divide the genus *Viola* into sections, and it is these sections that the reviser now wants to elevate to generic rank. There never has been any hard and fast rule for making genera—it all depends upon who is doing it, whether he calls a group of species a genus or makes this category for a species with several forms. By the newly proposed division, the bird-foot violet (*Viola pedata*) becomes the type of the new genus *Oionychion*, the pansies are typical of the genus *Mnemion*, *Viola pubescens* and its allies become *Crocion*, *Viola Canadensis* finds itself in *Lophion* while the remainder of the species though still placed in *Viola* are distributed in the subgenera *Euion*, *Hesperion*, *Eucentrion*, *Eulophion*, and *Rhabdotion*. At this juncture the supply of ions appears to have given out for we find one subgenus actually named *Verbasculum*. The word *ion*, it may be remarked, is the Greek for violet, which explains its use in this connection. Certainly the genus is properly ionized at last and we may hope that it will remain in a stable condition. What funny fellows these nomenclaturists are, to be sure!

EDITORIAL

One of our numerous societies for the protection of our native wild flowers lists the spring beauty (*Claytonia*) and the violet among the plants needing special protection and adds that the flowers of late summer may be freely picked. It may be doubted whether the violet and spring beauty stand in need of protection, but there are certainly some flowers of late summer that do. The idea that such blossoms may be freely picked must contribute not a little to the destruction of the gentians, sabbatias and the cardinal flower. What we need is not prohibition of all flower gathering, but discrimination in picking. In all our efforts toward flower protection it should be remembered that this movement is scarcely comparable with that which is so successfully protecting the birds. Even the conservation of our forests is on a different footing. Forests are not sufficiently portable to be carried off by an individual—only a Trust can rob us of them—nor are birds fastened to perches where they must remain until someone chooses to take them. If given half a chance the birds can remove themselves from harm's way; they do not go with the land. But with flowers it is different; though as attractive to many persons as the birds they cannot avoid anyone who wishes to pick them. If one refrains from killing a bird, there is a chance that it may fly away where others cannot secure it, but, in most cases, if one refrains from flower gathering he simply leaves the flowers to be picked by others. It is also to be remembered that flowers are universally regarded as intended for gathering. There is not a town of any size in the country where there is not one or more flower stores which offer cut flowers for sale. We see flowers everywhere: at weddings, funerals, parties, on the table, decorating the living room and the automobile. The very people most insistent on flower protection are great users of cut flowers. Even many of the plants bear out the idea that flowers are meant to be picked, for most bear more flowers than can ever ripen their seeds should they be fertilized, and the violet, one of the plants listed as needing protection actually bears large numbers of showy blossoms that rarely produce seed if left ungathered. These latter can certainly be picked without harming the plants.

No one would think of forbidding the owner of the forest to cut it down; how can we in reason then forbid the gathering of flowers on lands that are privately owned? If the owner is willing for them to be picked that is the end of the matter, and if he is not, he already has plenty of laws to protect them. The move toward flower protection is prompted by an admirable sentiment but it is only sentiment until it is linked up with practical and effective measures for accomplishing the end in view. It would seem that such methods still need to be devised. The end cannot be accomplished by pledging any number of people not to pick flowers. Probably the surest way to preserve the rarer members of our flora from extinction is to establish preserves for them in public parks and on large private estates. This is already being done to some extent, but we need a stronger sentiment in favor of such work. Often the owner of land on which rare species grow, though not interested in botany and careless of vegetation in general, may be induced to protect them when his attention is called to them simply because they are rare. The writer knows of several sanctuaries of this kind which have been established thus. There are many flowers, however, that because of their abundance or aggressiveness may be picked by all who will. Lists of such species ought to be published and the public taught to distinguish them. We would be glad to have lists of such species from our readers. We nominate the oxeye daisy to head the list supported by the wild sunflowers and the golden rods. Lists of species really in need of protection are also desired. Probably when the subject is broadly considered, it will be found that many species may not need protection throughout their range. In some states, or even larger regions, they may be so abundant as to need no protection.

BOOKS AND WRITERS

To anyone with a limited space that can be devoted to gardening, "The Backyard Farmer" by J. Willard Bolte should appeal. In some seventy-five short chapters, practically every phase of gardening is touched upon whether it be the growing of vegetables or flowers, or the care of poultry and other live stock. The novice here finds a wealth of suggestion for making the back yard of the suburban residence yield a large return of health, pleasure and profit with a minimum of effort. It is a good book for anybody beginning gardening to have and older students will find much in its pages of value. It is published by Forbes and Company, Chicago, at $1.00.

Prof. John H. Schaffner has revised his "Trees of Ohio and Surrounding Territory" and named the new issue "Field Manual of Trees." Though the book is small enough to fit into almost any pocket, it contains 150 pages in which the trees and large shrubs of the United States east of the Great Plains are clearly described. As a means for identifying the species, there are four sets of keys, one for them in their summer condition, one for the winter condition, one for the flowers and one for the fruits. Although there are no illustrations, it does not seem possible that even the beginner could go astray in naming his specimens. In addition to the characters by which the trees are known, the author gives much information regarding the qualities of the wood, its uses and the like. We regret to see a scientist of Prof. Schaffner's attainments adhering to the absurd "American Code" in matters of nomenclature. This, in the reviewers' opinion is the greatest defect in the book. A disposition is also shown to put forth the term ovulary in place of the better known and well established word ovary. The book is published by R. G. Adams & Co., Columbus, Ohio, at $1.25.

The demand for practical courses in agriculture for schools has led to the production of many text-books of varying grades of excellence, but one that deserves a prominent place is the volume by D. D. Mayne and K. L. Hatch entitled "High School Agriculture." The book begins, as all such books should, with a discussion of the chemistry of plants and the soil, and takes up next agricultural botany and economic plants and the insects and diseases that trouble them and ends with about a hundred pages devoted to farm animals and farm management. The book is especially full regarding the varieties of vegetables and other farm crops but seems lacking in cultural directions, especially those of a fundamental nature, for crops in general. There is also lacking a discussion of decorative planting, and plant breeding, two subjects that are so prominent in work with plants today that their omission is noticeable. The book is published by The American Book Company, New York.

Market and truck gardening, as distinguished from the growing of the more general farm crops, has thus far received little attention at the hands of the makers of books on agriculture, and yet, some of the truck gardener's single crops exceed in value the entire fruit crop of the United States including the citrus fruits, apples, peaches and prunes, as well as fruits of lesser importance. Practically the only comprehensive treatise on this phase of crop production is found in L. C. Corbett's "Garden Farming" which forms a new volume in the

Country Life Education Series issued by Ginn & Co. In this book, early chapters are devoted to a discussion of the principles of planting, cultivating, and marketing the crops, but the bulk of the book deals with the different crops in an alphabetical arrangement. In this part, specific information is given as to the methods of cultivation, the varieties grown, the kind of soil most suitable to each crop, the origin and uses of the plants and much other data that must prove of great value to the grower. A large number of illustrations make clear the operations described.

The authors of "Practical Botany"—J. Y. Bergen and O. W. Caldwell—have brought out a more elementary text designed for a half year course, which covers the same general field and bears the title of "An Introduction to Botany." Though issued but a short time after the larger work, the arrangement of the new book shows how rapidly the content of the botanical text is changing. The seed no longer holds first place in the presentation of the subject. Instead, the plant as a whole is first considered and some attention given to the manufacture of food, digestion, and related matters. Then follows the usual sequence of roots, stems, etc., with a brief survey of the lower groups of plant life. Throughout the book an attempt is made to connect the study with everyday life. In endeavoring to be lucid, however, the authors occasionally become obscure as in such sentences as "As a rule, animals eat plants or animals that have used plants as food." A set of questions follows each chapter but the questions are sometimes so indefinite as to be of little value. The book is well illustrated and the copious explanatory matter under each picture is to be especially commended. It is issued by Ginn & Co., and costs $1.15.

Dr. George Lincoln Walton, whose "Wildflowers and Fruits" was issued a few years ago, has produced another volume called "The Flower Finder" which, as its name indicates, is designed as a means of identifying the wildflowers. As in practically all books of this kind, the showy wildflowers are grouped in various ways—according to color, the arrangement and shape of the leaves, etc.—and these smaller groups are then easy to handle by means of brief Keys. Only the more conspicuous flowering plants are included in the book, but those that are listed are probably all that the ordinary botanizer would discover until he graduated into a more pretentious "Manual." The descriptive matter included the time of blooming, the common and scientific names, and various notes of popular interest. The derivation of the scientific names are given and the pronunciation indicated. Every alternate page is devoted to pen and ink drawings of the flowers—some 600 in all—by the author which will greatly assist in identifying the plants. The book is bound in flexible leather and is published by the J. B. Lippincott Co., Philadelphia. Price $2.00.

With the publication of "Rocky Mountain Wildflowers" by Doctors Frederic E. and Edith S. Clements, botanists are introduced to a new type of manual that seems likely to become popular as its merits become known. To begin with, the authors have not striven to give a double scientific name to every plant in the region covered; instead they very sensibly have described what are coming to be called "botanical species", that is, species that everyone recognizes as distinct, and have made the descriptions broad enough to include the numerous elementary species and other segregates so dear to the heart of the species-maker. This method of treatment is the result of the authors' inclination toward ecological rather than taxonomic subjects, but it is one that the flower lover will welcome. The book seems designed to indicate clearly the plants of the region instead of to involve the botanizer in a maze of technical verbiage. The best thing about the book, however, and one that cannot be praised too highly, is the method of keying out the species. In other books we are accustomed to the keys to the species that need to be backed up by copious descriptive matter, but here every species is singled out by some salient characteristic and no further description being needed, none is given. The book is also unique in departing in many ways from the accepted classification as illustrated in recent manuals, beginning, for instance, with buttercups and running into the mints before taking up such primitive families as the roses or arrowheads. There are twenty-five excellent plates in color by Mrs. Clements as well as some hundreds of figures in black-and-white and the text covers nearly 400 octavo pages. The arrangement of the type could have been improved by the selection of faces of greater contrast, but this defect is not likely to greatly bother those who consult the book. The area covered by the work is practically that of the Rocky Mountains in the United States and contiguous territory. The book is published by the H. W. Wilson Company of White Plains, N. Y., at $3.00.

Vol. 20. No. 3 Whole Number 102

THE AMERICAN BOTANIST

AUGUST, 1914

25 Cents a Copy; $1.00 a Year

WILLARD N. CLUTE & CO.
JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

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The Water Hyacinth.

THE AMERICAN BOTANIST

VOL. XX JOLIET, ILL., AUGUST, 1914 No. 3

"You scarce can say
If it be Summer still, or Autumn yet,
Rather it seems as if the twain had met
And Summer, being loath to go away,
Autumn retains her hand and begs of her to stay."

THE WATER HYACINTH

By Willard N. Clute.

THERE are many different species of flowering plants that live in the water, but very few that are not rooted in the mud at the bottom. Rooted plants are secured against being washed away or floated down to the sea on the streams and rivers, but since they can occupy only the shallows, a large area of water surface is still left to be occupied by such plants as have taken up a floating existence. Among the lower plants the floating habit is common. A large number of the algae are unattached, and many of the one celled forms do not merely float passively, but move actively about in the water like animals. Among the liverworts, several species of *Riccia* are floating plants and even the ferns have several species with this habit. The little water fern (*Azolla*) covers great stretches of stagnant water with its pink-tinged fronds, and its near relative, *Salvinia natans*, may be found in similar situations, though seldom so abundant. A tropical fern, *Ceratopteris thalictroides*, is known as the floating fern and may be found even in brackish water in the quiet inlets along the Gulf Coast.

Of floating species of flowering plants, the most abundant and wide spread are undoubtedly the duckweeds, though their flowers are so insignificant and so rarely produced that we may possibly not think of them as belonging to this class. Several of the bladderworts (*Utricularia*) also float and in the tropics the water lettuce (*Pistia spathulata*), a relative of Jack-in-the-pulpit, may be found thriving on the surface of pools and slow streams. The most singular of these floating plants, however, is doubtless the water hyacinth (*Piaropus crassipes*). Though a plant of considerable size, it has no difficulty in maintaining its position in the water, being buoyed up by its curious leaf-stalks which are dilated at the base and filled with air. The rootstalk from which these leaves rise is able to produce roots on occasion and when, through stress of circumstances, the plant finds itself stranded on a muddy shore it promptly sends out roots and lives as an anchored plant thereafter, though usually it is found floating. In favorable situations it may completely cover the water for long distances.

The water hyacinth is frequently seen in cultivation in the Northern States, and several dealers in aquatics offer it for sale. In the tropics, however, it is a most detested weed without value. In some Florida rivers it has proved such an obstacle to navigation that the national government has found it necessary to take strenuous measures to eradicate it. It is a native of tropical America and, though commonly cultivated in this country, the plant seems not to have taken up a wild life here until about 1890. Then it escaped from an artificial pool into the St. John's river in Florida and has since spread to the bayous and tidewater marshes as far as Louisiana.

In spite of its aggressive methods of colonization, the plant presents a beautiful sight when in full bloom, being thickly set with short spikes of purplish-lavender flowers held well above the water. The individual flowers are large and slightly two-lipped with the middle of the upper petal marked with deep blue and yellow. The leaf blades are rounded and somewhat spoon-shaped while the petioles bulge out into a nearly globular shape, forming efficient floats. When the plant is rooted in soil the leaves do not produce these enlarged petioles. The water hyacinth belongs to the pickerel weed family (*Pontederiaceae*), a rather erratic group of about twenty-five species inhabiting the warmer parts of the world. The only members of the family to push into the Northern States are the pickerel weed (*Pontederia*) and the mud plantain (*Heteranthera*). Others of this latter genus occur in our Southern waters.

The frontispiece illustrates a colony of the water hyacinth growing with the yellow lotus (*Nelumbium*) in an aquatic garden. We are indebted to Prof. Chas. O. Chambers for the photograph, which was made by C. H. Thompson.

THE SPIDER LILY

By Mrs. G. T. Drennan.

P*ANCRATIUM maritimum* is a native of the swamp lands of Louisiana, Florida, Mississippi and Alabama. It has many local names, among them Grayson's lily, cup-lily, swamp-lily, and most common of all, spider lily. Gray says the name is from a Greek word meaning all-powerful, for which he sees no obvious reason. Probably he never saw the *Pancratiums* at home on the banks of the bayous, lakes and rivers of the South. All-powerful is what they suggest. The long strap-shaped leaves, tropical in their luxuriance, are broad as a saddle-girth and of a shining, lively, light green. They are very striking where they grow in rank abundance, and, when planted in gardens, form no mean adornment.

The flower stalks are hollow, though tall and strong. From every bulb, from six to ten stalks shoot up. The flowers are borne in large clusters and are very different in construction from the true lilies. The long narrow divisions of the perianth, six in number, spread spider-like from the tube and from this projects a twelve-toothed, funnel-shaped corona bearing the stamens.

When viewed where nature has fostered their growth, amid the reeds, ferns, flags and tall grasses of the swamp lands, the blooming *Pancratiums* with their spreading snow-white perianth and broad stamen-cup, fringed with floating filaments form a feature of the landscape that is in keeping with the almost tropical luxuriance of their surroundings. Masses of the spider lily in bloom are like white pinioned birds in flight, so completely do they cover the rich green foundations above which the tall stalks support them. They are richly perfumed, as lilies are wont to be, and a large quantity near the house is open to the objection of too heavily freighting the air.

THE ADDER'S TONGUE

By Adella Prescott.

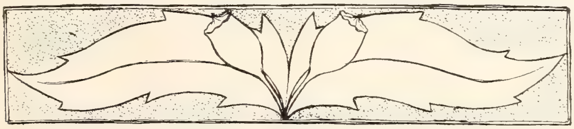
If the adder's tongue (*Ophioglossum vulgatum*) lacked the distinction of being "not common" there would be little about it to arouse the enthusiasm of the lover of ferns, for it is a small plant with neither grace nor beauty to attract the eye, but when Gray pronounces a plant "rare" or at least "not common," it does not need to be beautiful in order to be eagerly sought by all who are interested in Nature's handiwork.

The adder's tongue is a small plant, rarely more than a foot high and generally much less. The sterile portion is ovate and leaf-like with nothing to suggest the grace and delicacy of our more familiar ferns. It may be from two to four inches long and does not rise far above the grass in which it is likely to be found. The narrow fruiting spike is from half an inch to two inches or more in length and is considerably taller than the sterile portion. The plant has a short rootstalk with many short fleshy roots from which new plants are sometimes produced, and there is a freakishness about it that makes it interesting in spite of its lack of beauty.

It seems to have no special preferences as to habitat though the fact of its rarity might suggest that it would be very decided in its likings. The tallest specimens are perhaps found in sphagnum bogs but it grows with equal cheerfulness, if not with equal vigor, in the grass of old pastures and on hillocks of hemlock loam. One of its peculiarities is the lazy trick it seems to have of resting for a whole season and then going placidly on its way as if nothing unusual had occurred. I say "seems to have" because not very much is definitely known about it, but in one case, at least, the fact is beyond dispute.

Several years ago, I found a number of the plants growing on a barren hilltop where even moss had a hard struggle for existence. I dug two or three plants and carried them to my garden where they lived in apparent content the remainder of the season. The next year they failed to appear, but fortunately the spot was not disturbed and the succeeding summer they came up, hale and hearty, though they did not produce any fertile spikes. Since then, they have grown and fruited regularly and are larger than they were in their original home, though they are still rather small.

While there are about twenty species of *Ophioglossum* known, there is but one, or possibly two, found in Northeastern America—a fact which no one but the scientific botanist will greatly regret.



THE CACTUS AND THE DESERT

By Willard N. Clute.

ACCORDING to the idea of evolution held by adherents of the Darwinian theory, the cactus is the response of vegetation to desert conditions. Its thorns and spines are regarded as defenses originated by the plant for the protection of its edible pulp and precious moisture. It is looked upon as a case of the survival of the fittest. Plants not heavily enough armed to resist the attacks of grazing animals are supposed to have perished long ago, leaving only the most resistant to populate the desert.

While it is certainly true that the cacti are excellent illustrations of the survival of the fittest, they probably did not attain their present forms in just the way that the early evolutionists imagined. It is no longer believed that they have originated by gradual change helped on by the animals that ate the less efficiently armed. They probably first appeared about as we find them now. Probably, also, these forms did not arise in the desert but originated on the edge of it in response to various conditions. It should be remembered that the struggle for existence is not alone the struggle for sufficient moisture. Lack of light will as surely kill green plants as lack of water. In the desert light is always abundant. Given, then, a plant that can endure long sieges of drouth it may find the dryer regions of the earth desirable places of residence. Probably the cactus moved into the desert because the struggle for existence was less strenuous there. Too much water is as bad for most plants as too little, but the water lily and a few others adapted to deep water have escaped the crowd of plants by moving into the lakes and ponds in a manner similar to the movement of the cactus into the desert.

Cactus are not without their arborescent forms.
(Courtesy of Guide to Nature)

The spines of the cactus, instead of being reactions to the attacks of animals, appear to be caused by desert conditions. Wherever the air is dry, the vegetation, no matter what family of plants it belongs to, is likely to be armed. Moreover, cacti grown in a moist atmosphere tend to lose their spines, and even in some cases to put on leaves.

The thousand or more species of cactus are all American, though they are now to be found in many parts of the Old World. The dry regions in other parts of the earth, however, have forms that are almost identical with those of the cacti, but they belong to other plant families, among which the spurge family is prominent. Many of these curious spurges

The cactus is the response of vegetation to desert conditions.

(Courtesy of Guide to Nature)

are found in cultivation in the warmer parts of the world or in greenhouses elsewhere.

The cacti are not without their arborescent forms as our illustrations show. The stems of such forms are for the most part pulpy, like the smaller species, the fibrovascular bundles, often as large as broomsticks, forming a framework on which the other tissues of the stem are arranged. All the work of food-making goes on in the stem, the outer layers of which are

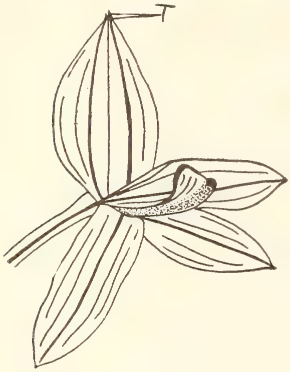
There appear to be an abundance of thick and leathery leaves.
(Courtesy of Guide to Nature)

green like the leaves of other plants for this purpose. In some species there appears to be an abundance of thick and leathery leaves, but a careful examination will show these to be really flattened stems. The spines that abound on most species are sometimes regarded as the remains of leaves but botanists are not agreed on this point.

AN ABNORMAL FLOWER OF CALOPOGON

By Edwin D. Hull.

AMONG a great many flowers of the grass pink (*Calopogon pulchellus*) in a bog near Hammond, Indiana, July 6, 1914, I found a single example which showed striking abnormalities as illustrated in the accompanying figure. It is seen that there are apparently but two sepals and two petals when normally there should be three and three. The apparent absence of a third sepal is explained by the fusion of two, the tips of these (T) distinctly but very little separated. There are but two petals in reality, as the lip is entirely absent, not showing even in a vestigial state, at least to the naked eye.



The absence of the lip does not seem to be of any significance, but it is interesting that the fusion of the two sepals is exactly what is prevalent in the genus of moccasin flowers (*Cypripedium*) which is regarded as the most primitive genus of orchids. If of any significance, this would, of course, be a case of reversion. It is possible, however, that the absence of the lip causes the fusion. In any event these abnormalities are very rare and interesting.

OUR GERARDIAS

By Dr. W. W. Bailey.

AMONG the most regal of our summer wildflowers, are the false foxgloves of the genus *Gerardia*. Belonging, as do the true foxgloves to the figwort family (Scrophulariaceae), they are all considered to be clandestine or root parasites. This fact is diagnosed by their habit of blackening in the process of drying. Even the most rapid operators often fail to procure good specimens.

With us in New England, the plants are about equally divided by color into two groups. In the one wherein the flowers are yellow, the plants are large and stately, with bell-like corollas an inch or more in length. The species most familiar to us is *G. pedicularia* which is viscid and glandular with deeply cut leaves and corollas thin and delicate in texture. It is generally from one to two feet high and when found is often abundant. In this species the corollas are almost always pierced by bees near the base. They probably find the hairy stamens an impediment.

Gerardia flava grows much more scattered and in the deep woods rather than, as is the case with the preceding, on the borders. It is a showy plant to meet with in a lonely wood path and can usually be taken home in good condition, while the blossoms of *pedicularia* fall too easily.

Another tall species formerly known as the oak-leaved (*quercifolia*) is now known as *Gerardia virginica*. In most respects it is much like the last except for its often deeply parted, or even twice parted leaves. It extends from Maine to Minnesota and southward.

In the other group of *Gerardias,* the plants are all low, some of them even dwarf and the flowers of varying shades of rose-purple. These usually grow in low sandy soil and are best known through the common purple gerardia, found everywhere. One who gathers it for the first time expects to reach home with a pretty bouquet but finds his flowers soon fall. A kindred species, *G. tenuifolia,* very like in appearance but with lighter colored flowers supported on thread-like stems, grows in dry copses and along woody pathways. Then, lastly, in salt marshes one finds *G. maritima* also purple and with thick, fleshy leaves, the sign of a halophyte.

Truly is *gerardia* an interesting genus, and well would it repay cultivation did not its parasitic habit render that nearly impossible. To grow both plant and host together has hitherto nearly defied accomplishment. It may be, however, that with increased knowledge, these mysteries of growth may be solved.

THE ART OF NAMING PLANTS

TAXONOMY has its place. It trains the perceptive faculties, teaches orderliness, develops judgment, and strengthens reason. There is a saving grace in botany not found in most of the other sciences and this is exercised through taxonomy more fully than through all the other divisions of botany combined.

Systematic botany furnishes to the average layman a more continuous incentive for pleasurable and inspiring contact with the world about him than any other subject which lays claim to a place in a cultural course. It may be the primitive phase, but most great botanists, at least, began at this point, thus illustrating in their development the recapitulation theory. Systematists were never so numerous nor more active than at present, but all activity is not necessarily progress. Motion up and down may be spectacular and nothing more.

There is but one reason for the existence of the professional systematist, viz: to make it easier for others to know plants. If we fail in this one thing we fail in all. Judging by the indifference of the multitude to our work; by the helplessness of the amateur who tries to acquaint himself with the plants he meets; by the none-too-well concealed cynicism of our colleagues in other lines, we are failing in this. Our work has been analytic and not constructive. We have dismembered organisms and held up to view their component parts. We have been looking for differences and with such amazing success that the fundamental resemblances have, for the most part, escaped our notice.

Morphology, physiology, ecology, and economic botany in its scores of applications have all gone forward by leaps and bounds, but in spite of, not by the aid of, taxonomy. Not all taxonomic work has been useless or erroneous. Keenness of observation and great powers of discrimination are not lacking. It is not so much that what has been done should not have been done, but rather that more should have been done to relate recent work to that which has gone before. Synthesis should have followed so closely upon analysis of the elements of our flora that duplications would promptly have been discovered and the relations of each element to the other detected and stated.

We are on the eve of a new era of reconstruction. Already the pendulum is swinging back toward greater conservatism. The dismemberment of genera and the multiplication of species proceeds more cautiously. This grows out of the revitalized aim, "make it easier for others to know plants."
—*Aven Nelson in Science.*

RARE SHRUBS FOR DECORATIVE PLANTING

By Willard N. Clute.

PLANTING time is again approaching. We do not now refer to spring, with its strenuous hours devoted to getting the seeds of both food and flowering plants into the soil, but to that more leisurely season, Autumn, when man is less busily employed and nature is doing the planting. In the case of all but our cultivated plants, autumn, instead of spring, is the true planting season, and even among the cultivated species there are some that must be planted in the fall to produce satisfactory results. The autumn seed-bed is a recognized fixture with amateur gardners.

Important as autumn planting is, it is overshadowed by autumn transplanting, which, after all, is only another kind of planting. At this season nearly all kinds of plants can be moved with the least possible risk. The leaves, if they have not already been shed, are being slowly cut off by the plant and in the soil the roothairs are ceasing to function. The plants are preparing for a dormant period, and a change in location affects them but little. The principal danger is that if they are carelessly transplanted, they may not become settled in their new situation before freezing weather sets in and so may be harmed by the alternate freezing and thawing. It should be more generally known that it is not cold itself, that harms most plants; it is the heaving of the plants by the frost and the consequent breaking of the roots that causes the mischief. If plants are carefully planted and the roots protected by a good heavy mulch of stable manure or other coarse litter, they are almost certain to go through the winter unharmed.

Apparently the most difficult part of planting is selecting what to plant. This phase of the subject has heretofore received scant attention, for few have realized how easy it is to give an air of individuality to the home grounds. The general public has been content to go on planting about a dozen different species of common shrubs, such as lilacs, syringas, spiraeas and the like when there is a much larger list to choose from and one that has every advantage on the side of beauty and decorative usefulness. To be sure the species commonly

Smoke tree enveloped in a nebulous haze of pale purple.
(Courtesy of Meehans' Garden Bulletin)

planted have the merit of being exceedingly hardy, very floriferous and almost sure to bloom annually, but many less known plants have all these characteristics. Even the species commonly planted have relatives fully as beautiful and interesting. The Persian lilac, for instance, costs no more than the familiar shrub of grandmother's garden and is a much more graceful and charming plant.

The abundant flowers of the Pearl Bush.
(Courtesy of Meehans' Garden Bulletin)

It is unlikely that any other spiraea will ever supplant the bridal wreath (*Spiraea Vanhouttii*) but its smaller relative, known as the snow garland (*S. Thunbergii*) deserves more frequent planting. It is one of the earliest of shrubs to bloom and its wand-like branches laden with small, white, star-shaped flowers is warrant enough for the common name. About the time that the snow garland becomes conspicuous in the shrubberies, a little known relative of another common species comes into bloom. This is the cornelian cherry (*Cornus mas*) which as anyone familiar with generic names will perceive, is not a cherry at all, but one of the dogwoods. The red-stemmed dogwoods (*Cornus stolonifera* and *C. sanguinea*) are planted everywhere for the warm and pleasing effect of their red bark contrasted with snowbanks, but one who knows only these species would scarcely recognize the cornelian cherry as belonging to the group. All our native dogwoods have white or creamy flowers which open as the leaves unfold or after they are spread. The cornelian cherry, on the contrary, has bright yellow flowers which appear before the leaves. It forms a round headed shrub some ten feet high and, when covered with its clusters of flowers, is a most conspicuous object and one that adds much to the appearance of our borders at the beginning of the vernal season. Later in the year the flowers are followed by red, purple, or yellow fruits.

In spring, however, shrubs may usually be depended on to bloom. The great difficulty has always been to secure shrubs that will bloom after the first burst of spring has passed. Although summer flowering shrubs are rare in comparison with those that bloom earlier in the year, a number exist, and one who would give an air of individuality to his grounds should plant them. First in the list of this kind should be placed the rose of Sharon (*Hibiscus syriacus*) a well known plant of old fashioned gardens that deserves a place in all new ones. During July, August and part of September, it is literally covered with bell-shaped, blue, pink or white flowers that rather closely resemble the hollyhock.

The angelica tree (*Aralia Chinensis*) and the devil's walking stick (*A. spinosa*) are two members of the ginseng family that are easy to grow, curious in appearance and practically certain to produce great panicles of creamy-white flowers every August. These plants have few true branches, but they bear immense decompound leaves that have all the appearance of being such. In winter, when the great leaves have fallen, the stout, thorny stems, stiffly erect, have an odd appearance which no doubt accounts for at least one of the common names.

One species of tamarisk (*Tamarix gallica*) blooms in midsummer. It has long slender branches thickly set with tiny leaves like those of the cedar and the minute rosy flowers are borne in spikes along the branches. It is quite unlike other common plants and is most desirable for the contrasts it makes. It is a native of the rather dry and sterile parts of the Old World and will thrive even in poor soil. Another species, *Tamarix parviflora,* blooms earlier in the year and should not be selected if summer flowers are wanted.

A summer flowering Japanese tree that is coming into cultivation is the pagoda tree (*Sophora Japonica*). It bears long racemes of white flowers set off by the shining leathery leaves. The tree, itself, is shaped much like a well grown Persian lilac. The varnish tree (*Kolreuteria paniculata*) is another species that is not well known at present. It belongs to the soap-berry family and is therefore akin to the maples and horsechestnuts. It bears large panicles of bright yellow flowers at a season when flowering shrubs of any kind are desirable, and will doubtless become more common as its merits become known.

Equally rare in the Northern States, at least, is the chaste tree (*Vitex agnus-castus*). In late summer it puts forth a profusion of violet purple flowers disposed in dense terminal racemes. The whole plant has an aromatic odor when bruised. Unfortunately the plant is doubtfully hardy north of the Ohio river, though it is said to thrive in parts of Pennsylvania and with some winter protection would doubtless endure the winters much farther north. The interesting nature of the shrub makes every effort to extend its range worth while.

Here, too, may be added a not very distant relative of the soap berry which is commonly known as the smoke tree. This is really a sumac (*Rhus cotinus*) though it has little resemblance to our common kinds. Its attractiveness lies in its clusters of fruit stems or pedicels. The plant rarely fruits, but after blooming the pedicels lengthen and branch and being covered with longish hairs make the whole bush appear as if enveloped in a nebulous haze of pale purple.

The Japanese Storax.
(Courtesy of Meehans' Garden Bulletin)

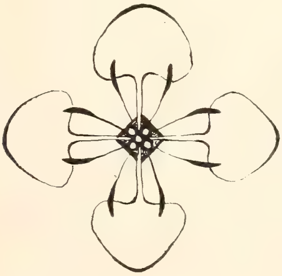
The witch hazel (*Hamamelis Virginica*) which can be dug in almost any thicket in the Northern States is undoubtedly the latest of all shrubs to bloom, but it is not the only autumn flowering shrub. The blue spiraea (*Caryopteris mastacantha*) does not begin to open its blossoms until September but it continues in bloom for a month or more. The plant is not a spiraea, being more nearly allied to the chaste tree. Its appearance, however, is much like a low spiraea, which accounts for the dealer's name for it. It is also known as Chinese beardwort.

This phase of the subject should not be left without some mention of the bush clover (*Desmodium penduliflorum*). It is neither a bush nor a clover, though it simulates both close enough to deserve its common name. In late September it is literally covered with racemes of pink pea-like flowers which make it very conspicuous. It dies to the ground in winter, though very shrub-like in appearance.

Coming back to shrubs that will give additional beauty to our shrubberies in spring, we find a wealth of material from which to choose, exclusive of the popular favorites. The pearl bush (*Exochorda grandiflora*) is an excellent species for varying the monotony of viburnums, syringas, and deutzias. As its common name indicates, the flowers are pearly white and are produced in abundance on the ends of the branches. The globe flower (*Kerria Japonica*) with flowers like small yellow roses is an interesting addition to the border, not alone because of its flowers but also on account of its stems which are covered with green bark that gives a touch of vitality to the shrubbery even in winter. In autumn it frequently produces a second crop of flowers. Another species, which for want of a better name is known as the white kerria (*Rhodotypos kerrioides*) has rather larger white flowers that somewhat resemble those of the blackberry. The shrub forms a compact green head that even dry weather seems nearly powerless to injure.

The laburnum or golden chain (*Cytissus laburnum*) is better known in the Old World than it is here, but it is one of the most attractive of plants. At the blooming season it is thickly set with long drooping racemes of yellow flowers very much like those of the locust in size and shape. When in blossom, few shrubs are prettier. The fringe tree (*Chionanthes Virginica*) a near relative of the ash, olive, and privet is another attractive species with thick and shining entire leaves and a profusion of flowers with narrow drooping petals that make the common name unusually appropriate. The fringe tree is also related to our lilacs and golden bells (*Forsythia*) but the silver bell, though having flowers not unlike the *Forsythia,* is a member of the ebony family. To the same family belongs the storax with white bell-shaped flowers. There are two or three species of storax in our Southern States, but the plant most frequently found in cultivation is a species from Japan, *Styrax Japonica.*

The rarer shrubs are seldom carried in stock by the smaller nurseries. These depend upon local patronage and must provide the common things for which there is a greater demand. The plants mentioned here, as well as a great variety of others equally interesting may be obtained of the Biltmore Nursery, Biltmore, N. C.; The Peters Nursery Co., Knoxville, Tenn., or of Thomas Meehan & Sons, Germantown, Pa. These firms issue illustrated catalogues that are well worth having for reference even if one never expects to set out a shrub.



DAPHNE CNEORUM

THE ease or difficulty of propagation makes plants common or rare. It also largely determines the price of plants, those difficult of propagation always costing more than those which may be readily multiplied. Unfortunately on this account, some of our most beautiful garden plants are rare or not as well known as they deserve to be. *Daphne cneorum* is one of these. It belongs to that select little family Thymelaeaceae, one of the few families of plants that "hasn't any poor relations." It has but one protoplasmic relative, in the Eastern States at least, and that is the leatherwood or wicopy (*Dirca palustris.*)

Daphne cneorum is a native of the mountains of middle Europe and, like many plants which hail from high altitudes, is of a low, prostrate or spreading habit. It is an evergreen and shrubby in character. The branches are supple and inclined to be leathery and are well clothed with small, narrow sessile leaves, oblanceolate in outline and alternately arranged. The bright pink, deliciously fragrant flowers are produced in terminal clusters abundantly in May (often earlier) and continue more or less freely till September or October. It does not appear to produce seeds in this country, probably because we have not the insect to bring about fertilization. The method of propagation most commonly practiced is layering which should be done in June.

Daphne cneorum has proved perfectly hardy in Massachusetts. It thrives in any fairly good soil but prefers a rich peaty soil either in full sun or shade, although it does its very best if planted where it can receive some shade during the hottest part of the day. It is an excellent subject for the rock garden, or it may be planted in the hardy perennial border or in beds by itself or it may be used as a ground cover among compact growing shrubs.—*Hubert M. Canning in Horticulture.*

VITALITY OF AN ORANGE TREE STUMP

By C. F. Saunders.

THE house occupied by the writer in California was built at the edge of an orange grove. Two or three of the trees were cut down to make room for the house, which was erected without a cellar but raised by a low stone foundation wall some three feet above the ground. The stump of one of the felled orange trees is under the house in the dark space between earth and floor, about ten feet distant from a small window opening to the garden, whence it receives a little light. The curious part of this story is, that this imprisoned stump, which ceased to be a tree and became a stump just nine years ago, promptly put up a number of sprouts and in spite of the darkness and aridity of its surroundings, still supports a thrifty little crop of them a couple of feet in length. In all these nine years, the stump has never received a drop of water from above ground and is growing in thick dust. Probably the roots have worked outward beneath and beyond the foundation walls to the region of winter rains and summer irrigation which the garden enjoys and so sucks in some moisture. Nevertheless the case seems a noteworthy one of tree vitality under very discouraging conditions.

NOTE *and* COMMENT

Evolution Reversed.—Dr. William Bateson, president of the British Association for the Advancement of Science, intimates that our ideas of evolution need a rearrangement. In his Presidential Address he suggests that instead of evolution in general moving from the simple to the complex, that it may be just the other way about. Usually we have assumed the appearance of a new characteristic in plants or animals to be developed *de novo* to fit the conditions to be met, but Bateson's work in plant breeding has convinced him that no character can arise that was not latent in the cell from the beginning. If a new color appears in a flower, for instance, he explains it by the loss of some character that caused the normal color or by the appearance of a color factor that has previously lain dormant in the plant. So with other characters. All are regarded as existing in the cell and produced or suppressed as circumstances determine. Some characters he supposes to originate by *fractionation* of the original characters or by a rearrangement of such characters. To illustrate this he cites the case of the sweet pea which consists of a single purple-and-white flowered species that up to the present it has been impossible to cross with any other plant; and yet breeding has produced a most remarkable series of colors in the flowers. Similar conditions as to color, size, and flavor exist in our various apples which are regarded as the descendants of a single wild species. All the different forms are supposed by Bateson to be due to the loss of some deterrant factor. The old evolution explains such cases by the reverse of this process; that is, each new form was assumed to be due to the gain of some character. Darwin's idea of the matter seems the more plausible of the two and we may wait for more evidence before accepting Bateson too literally. Upon the theory he propounds, all yellow flowered species should contain in them the determiner for red flowers and all red fruits possess the capability for yellow ones.

PRAIRIE PLANTS.—The region in which this magazine is printed is subject to long summer drouths. When, as frequently happens, no rain falls for from thirty to sixty days or more in the growing season the effect on vegetation can be imagined. Cultivated crops often prove entire or partial failures unless the farmer anticipates the lack of moisture at the beginning of the season and holds the moisture in the soil by proper cultivation. Even in seasons of drouth, however, the wild plants seldom fail to make a crop. The compass plants, the sunflowers, the wild vervains and many others remain fresh and green long after the grasses have become dry enough for prairie fires, but there is a noticeable lack of plants that flower and fruit at the height of the dry season. In these frequent drouths, we see one cause of prairies. Plants that require a fairly constant supply of moisture can not endure the conditions here and give up the struggle. Seedling trees, though doubtless often started, sooner or later find a season too dry for them. Thus the prairies are treeless except along the watercourses. The fires that still occasionally sweep across such areas are extremely harmful to all species that do not have some sort of a perennial stem underground. Prairies are like deserts in that the rainfall is unevenly distributed. There are no deserts in which some rain does not fall annually, while some deserts, at certain seasons are as flowery as any meadow. It is the long intervals between rainy seasons that cause the death of all but the most resistant plants. In the prairie region the drouths are of shorter duration but they are still long enough to eliminate many moisture-loving plants and to prevent the growth of trees.

SEPALS OR PETALS IN HEPATICA.—All botanical works tell us that the conspicuous colored parts of the hepatica flower are sepals, but Edward L. Greene in a recent number of the *Midland Naturalist* presents some evidence to the contrary. In a Wisconsin wood he found a number of these plants from which not only the colored parts had fallen, but the three green sepal-like objects that enclose them in the bud as well. Heretofore these green objects have been considered as forming an involucre of three bracts, but if they fall with the other floral parts, they might be considered as true sepals and the colored parts as petals. It is not uncommon for plants in fruit to retain the sepals though the petals fall early, but if one finds peduncles of hepatica that have failed to fruit and from which the green objects have fallen, the evidence that we are dealing with sepals is rather convincing. The species that form the Ranunculaceae or buttercup family present no uniformity as to the presence or absence of a corolla. *Clematis* and *Anemone,* for example, though having flowers brightly colored, are regarded as having no petals, while *Aquilegia, Ranunculus,* and *Delphinium* have petals as well as sepals.

BERRIES OF SMILACINA STELLATA.—One does not have to go far in any botanical Manual to discover that those who make our textbooks are quite as fallible as anybody else. When they are in doubt they have a reprehensible habit of guessing at the facts or of copying from someone else. The latter method sometimes causes them to make absurd mistakes, as did the author who copied a description of a small Western composite. In the original description a typographical error made the ray-flowers two *feet* long, instead of so many inches, but the purloiner of the description never saw the mistake and copied it word for word. When the Manual makers begin to guess they are not much better off. For a long time the berries of the false Solomon's seal (*Smilacina racemosa*) were said to be purple-dotted at maturity, when, in reality, they are so marked only when they begin to ripen, being clear red at maturity. Apparently somebody made the mistake and the rest copied it. A similar error exists in the Manuals regarding the fruits of an allied species, the starry Solomon's seal (*Smilacina stellata*). The new Gray's Manual dodges the point, but the sixth edition says "berries blackish." Britton has them "green, with six black stripes, or blackish," and Matthews calls the fruit "spotted". Wood, who was an acute observer, comes nearest to the truth but cannot quite get away from the general idea that the fruit is black, saying "dull ruby-red, nearly black." As a matter of fact, the berries until nearly ripe are green in color, striped from base to apex with six purplish-black lines, three twice as broad as the others and alternating with them. Later these black stripes disappear and the berry becomes clear, dark red. The berries, even at maturity, are sub-triangular in cross section, not globular as the books have it, with a single hard seed in each of the angles. The broader stripes of black mark the line along which the carpels are joined.

COLOR VARIATION IN RUDBECKIA.—In the November, 1913, number of this periodical, the editor in his discussion of the variously colored forms of *Rudbeckia hirta* leaves little room for new varieties. There is, however, a form which, while belonging to the general type of *R. hirta* var. *annulata*, differs from it in that the outer ends of the rays are not colored a solid brownish red, but are only spotted. In the specimen which I found and planted in my garden the spots are more reddish than brown. This plant was found in rather dry gritty or sandy soil in an open field toward the northern end of New Rochelle, N. Y. It bore two flower heads; one as described above, the other with the ordinary yellow rays. The day before, at Scarsdale, N. Y., in a rather damp spot, I found a specimen of *R. hirta* var. *bicolor*. In this the inner part of the rays for about one-sixth of their length are colored a rich velvety brown.—*Edwin W. Humphreys.* [Until one searches through a good-sized colony of any plant, he does not realize the amount of variation in the species that is constantly cropping out. Differences in color are possibly the most numerous, but variations in size, time of blooming, floriferousness and many other features abound. The philosophical botanist in taking note of these may find entertainment that is quite as pleasant as discovering the species themselves.—ED.]

COLOR CHANGES IN YELLOW FLOWERS.—Plants with pure yellow flowers rarely produce albinos though they may give rise to blossoms much paler than ordinary. These are often spoken of as primrose-colored forms. In Composites with yellow or orange-yellow rays, a number of these paler forms have been distinguished and named. It would appear from the studies of Prof. T. D. A. Cockerell that the paler color may be due to the dropping out of a "determiner" whose presence accounts for the deeper color in other flowers. Breeding experiments have shown that the primrose color is "recessive" to orange yellow, as the evolutionists say, and breeds out according to Mendelian principles. Sections of some of the flowers show that the difference in color is largely due to a difference in the amount of pigment in the cells, though the pigment itself may be paler in the aberrant forms. The phenomena of these colors are doubtless akin to the condition in normally red flowers or fruits which on occasion produce yellow variations.

DOCTORATES IN BOTANY.—Each year the colleges and universities turn loose a new crop of Doctors—not the medical variety, which is likely first to come to mind and which has special schools for its production—but Doctors of Philosophy. During the past seventeen years 2,786 degrees of this kind have been conferred in science. The crop for 1914 is reasonably good and consists of 241 degrees though it is probably regarded as a short crop by many who would add a handle to their names. It will probably be no consolation to such to be reminded of the aphorism that "the man who needs a degree never ought to have one." In the recent distribution of these honors, it is interesting to note that the botanists were out in full force and carried away 34 degrees, being only surpassed in this respect by the chemists. There should now be 275 botanical Doctors in the country—at least that number of degrees has been conferred on botanists in the time covered by the records.

Rattlesnake Fern With Two Fronds.—In confirmation of what was said in a recent number of this magazine regarding the form called *Botrychium dichronum,* Miss Adella Prescott writes: "Two years ago, I found in this vicinity [Central New York] a specimen of *Botrychium Virginianum* having two sterile fronds. I found it late in the season (September or October) and there is no sign of a fertile frond on either of the sterile ones. One of the fronds was yellow and faded, evidently an old frond though still perfect in shape, while the other was fresh and green." It may be added in this connection that the *Botrychiums* are a very provident lot of plants. They usually plan for several seasons in advance and careful dissection will often show the buds in successively smaller sizes, for five seasons to come, enclosed in the base of the stipe. That more than one bud may develop on occasion there seems to be no reason to doubt. The *dichronum* form, however, grows in warmer regions and its two fronds are due to another cause. One frond is the frond from a previous season which the milder climate has permitted to remain until the frond of the succeeding season is spread.

Flour From Flowers.—Although the title of this paragraph would seem to indicate that certain flowers may provide the basis for bread-making, it was not our intention to give this impression, though it is said that the pollen of the staminate cat-tail flowers is sometimes used for bread-making in India. At present we are interested in pointing out the fact that the word, flour, has really been derived from the word which designates the blossom of a plant. To most people the flower is the best part of the plant. So settled is this, that amateur gardeners may often be heard to speak of their flowers when only leaves and stems are in sight. In a similar way, then, the flour was the best part of the meal; one might say the flowering part, just as we now speak of the *efflorescence* of a salt to indicate the fine powder that often forms upon it. The idea of a blossom is also embalmed in various other words with which we rarely associate it at present. For instance, to florish once meant to bear flowers in profusion, though we now speak of a plant as florishing if it merely produces an abundance of leaves. The word, however, indicates how closely the idea of the general wellbeing of the plant and floriferousness are connected. Florid, again, originally meant covered with flowers. We still speak of flowery discourse or florid language and by a sort of extension of the idea, of a florid complexion. The word florin, which has been in use for centuries to designate various foreign coins also shows a derivation from the flower. The first florin was coined in Florence but did not take its name from that city. It was called a florin because it bore a flower—a lily—upon it. The word flower originally came from the Latin *flos* or *floris*.

JOHN BURROUGHS ON "NATURE STUDY."—I have a suspicion that "nature study" as now followed in the schools—or shall I say in the colleges?—this class-room peeping and prying into the mechanism of life, dissecting, probing, tabulating, void of free observation and shut away from the open air—would have cured me of my love for nature. For love is the main thing, the prime thing, and to train the eye and ear and acquaint one with the spirit of the great out-of-doors, rather than a lot of minute facts about nature is, or should be, the object of nature study. Who cares about the anatomy of the frog? But to know the live frog—his place in the season and the landscape and his life history—is something. If I wanted to instill the love of nature in a child's heart, I should do it in the first place through country life, and in the next place through the best literature, rather than through class room investigations or through books of facts about the mere mechanics of nature. Biology is all right for those who wish to specialize in that branch, but for the mass of pupils it is a waste of time. Love of nature cannot be commanded or taught, but in some minds it can be stimulated.—*From "Our Friend John Burroughs."*

ABSORPTION OF SALTS BY PLANTS.—Plants absorb a much greater amount of water than they ever use in building up their parts. In some cases the amount used seems almost incredible. The common mustard is said to use 900 pounds of water for each pound of dry matter the plant contains. It is well known, of course, that there is a constant influx of water at the roots and as regular an outflow from the leaves in the form of water vapor. This current of water through the plant is called the transpiration stream. This stream was formerly thought to be of service to the plant by bringing in the mineral salts used, but some investigations made by Heinrich Hasselbring has shown that the amount of mineral matter (ash) in a plant in no way depends on the amount of the transpiration stream. The transpiration from two sets of plants of the same species, one in sun and the other in shade, was measured and, though the plants in the sun gave off the more moisture, the set in the shade was found to contain the more ash. This seems to show that the absorption of mineral by plants does not depend upon the amount of water absorbed. Probably a large part of the water taken in is simply used in keeping the plant cool, just as our perspiration regulates the heat of our own bodies.

ORIGIN OF TUBERS IN RUE ANEMONE.—Among the interesting features of plant life to the beginning botanist, is the sight of the several elongated tubers that cluster at the base of the rue anemone's stem. The arrangement is not exactly like that of any other plant. There are plenty of plants that bear tubers, but in most cases these organs are formed at the end of short subterranean branches, or else there is a single tuber from which the aerial stems grow. In the rue anemone the tubers radiate from the base of the stem and their position has induced Richard Vogt to watch the young seedling to see how they are formed. His conclusions are reported in the *Midland Naturalist.* The seedling plant rarely produces more than one leaf the first year, exclusive of the cotyledons. The primary root produces a few secondary roots at its base and then dies. Later the caulicle or hypocotyl, as the stem below the cotyledons is called, increases in diameter and acts as a place of food storage during the first winter. When growth is resumed, two or three leaves are produced and from the base of each a root arises which by autumn has assumed the tuber-like form with which we are familiar. Each succeeding leaf appears to form one of these tuberous storehouses. It thus turns out that what we commonly call tubers in this plant are not true tubers, for the latter are modified stems and not rootlike in origin. The common potato is therefore a tuber, but the sweet potato is not; it is a tuberous root much like the objects from which the rue anemone stem is produced.

THE CABBAGE IN PHILOLOGY.—When we speak of a cabbage head, we rather overstate things, for the word, cabbage, itself means head if the students of language are correct. In the Latin tongue, *caput* signifies head. The French equivalent is *caboche* and in the English this becomes cabbage. The cabbage, however, is only one form of the species. The kohl rabi, cauliflower, kale, Brussels sprouts and broccoli are other well known forms. All these are often designated by the Anglo-Saxon word *cole* which is also derived through the Latin from the Greek *kaulos* meaning a stem. In the Latin the word becomes *caulis* and in the Scotch, Icelandic and other Northern languages it becomes *cal, cawl, kal, cole* and *kale*. The modern

French term for cabbage is *chou* which is also derived from the Latin *caulis*. From *chou* has been derived the term cold-slaw to designate cabbage prepared as a salad. The word was originally *cole-chou*. Cauliflower is readily seen to be derived from *caulis* and flower (*floris* in the Latin). Collard, the name of a kind of cabbage common in southern markets is a corruption of colewort, and kohl rabi was originally the Italian *cavoli rape* or rape stem—rape being another species closely related to the cabbage.

OSAGE ORANGE AS A DYE-WOOD.—It does not seem to be generally known that the osage orange (*Maclura pomifera*) so familiar as a hedge plant in the Middle West, is the source of a dye of some importance. The heart wood is orange yellow in color and it is from this wood that the dye is obtained. F. W. Kressman recently reported to the American Chemical Society that an examination of wood from Texas showed that it contained moric and moritannic acid like the tropical dye-wood, fustic, and in about the same amount. A comparative series of dyeing experiments showed that the osage orange wood is fully as valuable as fustic for dyeing, both as to the color, which is a clear yellow, and as to its ability to stand light, weather, washing, etc., without fading. Notwithstanding the way in which aniline colors are pushing to the front, there is a considerable traffic still carried on in natural dye-woods, such as logwood and the like. Now that a tremendous disturbance exists in the countries producing most of the aniline dyes, we may yet have to depend on these domestic dyes as we did, to a considerable extent, during the Civil War.

NUMBER OF RAYS IN HELIANTHUS.—Until one has counted the ray-flowers in a number of sunflower heads, he does not realize the amount of variation of which they are capable. A count of 351 heads of *Helianthus grosse-serratus* shows that the average number of rays is 13, but there is a wide distribution of the numbers. Five heads had 10 rays each and one had 24. A surprise in this count was that there were thirty heads with 21 rays each. When these numbers are represented in the form of a graph, there are two peaks, one on 13 and the other on 21. As a contrast to this species, 243 heads of the common Jerusalem artichoke (*H. tuberosus*) were counted. In this species the average number of rays is 12. Three heads had but 8 rays and one had 15. The variation in the latter species is much less than in *H. grosse-serratus,* and the graph has a single peak. From this one might infer that in *H. grosse-serratus* there is a form included which might be brought out by breeding. An interesting piece of work would be the counting of the ray-flowers of all our composites and deciding what the average number in each species is. Counts from different localities might be undertaken and counts in different seasons made to discover the effects of soil, moisture, etc., if any. The results would throw considerable light on the tendency of plants to vary in different directions.

Extract of Witch Hazel.—Some idea of the number of contusions and abrasions that are sustained by luckless humanity in the course of a year may be gained from the fact that the annual output of witch hazel extract is about twenty-five thousand barrels. According to *Gardening,* the home of the witch hazel industry is in Connecticut. The bulk of the extract comes from a limited district in eastern Middlesex county. New York, New Hampshire and Massachusetts supply most of the remainder. The production of the extract is quite simple. All that is required is a primitive still and some means of cutting the hazel brush into proper lengths. In a similar way extract of wintergreen is made in New York and Pennsylvania from birch twigs. It may be news to some that birch is the source of wintergreen extract, but the oil contained in the two plants is so near alike that it cannot be distinguished chemically and that from the birch has long been substituted for wintergreen since the difficulties in gathering an adequate supply of the latter plant are considerable. However, since oil of wintergreen can now be made synthetically in the chemical laboratory, it is likely that the birch stills will soon fall into disuse.

Two-Seeded Acorns.—We often know the least about the most familiar things and this is likely to be the case with more than one botanist in regard to the fruits of the oak. We are prone to think of acorns as one-seeded fruits, but if the original intention of nature were carried out, we should probably call it a several seeded capsule or something of the kind. As a matter of fact, the young acorn is three celled with two ovules in each cell which ought to give at least six seeds to an acorn, but it does not work out that way. The single seed that we usually find in the acorn at maturity is an interesting case of selfishness for it has developed at the expense of its fellow ovules and simply crowded them out of existence. Often their flattened remains may be found in the ripe acorn. When each young acorn contains several ovules it is but natural that occasionally an extra ovule may have such a start that its life cannot be squeezed out in this way and thus we find two seeds in one acorn. Rarely three seeds are found but usually only two occur. Such occurrences are said to be not uncommon in the white oak (*Quercus alba*) the chestnut oak (*Q. prinos*) the British oak (*Q. robur*) and the red oak (*Q. rubra*). The phenomenon appears to be most common in oaks with large acorns. In the red oak, according to J. G. Jack who examined two hundred acorns taken at random from a large number, as many as 30% may have two seeds. While on this subject, it may be interesting to point out that the genus to which the cherry, peach, and almond belong has a pistil which normally contains two ovules though only one develops. We ought to find two embryos in every cherry pit. That the condition is not uncommon in the almond is attested by the frequency of philopenas when the nuts are passed to the young folks.

EDITORIAL

The reason for the tardy appearance of the present number of this magazine is the fact that the editor has been hampered by a lack of the right kind of manuscript. With surprising egotism he feels perfectly equal to writing the whole issue every time, but with becoming modesty he prefers that others be given first place if they will take it. So he has held back a bit. Of course all of our old readers know that the numbers will ultimately appear; it is only the newer subscribers that fear the magazine has suspended publication when it does not appear on time. However, we need more manuscript, but it must be of the right kind. During the past quarter we have refused enough material to fill the magazine several times, because it did not exactly fit our scope. It does seem, however, as if among all our readers there must be many more with eyes to see the interesting things in plant life and sufficient literary ability to describe them attractively. We are well aware that our readers are not mere plant collecting amateurs—they would not be our readers if they were—and this makes their failure to contribute their observations all the more remarkable. If no response is received to our appeal for more manuscripts, the editor will be tempted to issue through the magazine a new booklet he has been making on the colors of flowers.

* * *

We have been highly honored—the New York Public Library has asked us to send them this magazine regularly. However, they ask us to send it free, and, after turning this proposition over in our minds for a while, we do not feel so highly honored after all. We rather dislike to be taken for "easy marks." It must be that they consider us such or they would not invite us to contribute from our own resources when their own are so much larger. Still, they write that "we are receiving in this manner a large number of scientific publications" so we are either off in our reasoning or there are a lot of other publishers that are in that condition. What puzzles us is why we should send the magazine to any individual or group of individuals without receiving an adequate return for it. If we could only work the butcher and the grocer in the same way, it would not seem so strange. Why, even the printer who helps make the magazine expects pay for his work! Libraries must take the publishers of botanical publications for millionaires. As a matter of fact they have to have some means of their own or their publications would not last long as the support of the public goes at present. We believe it would do the average New Yorker good to read this magazine regularly, but we are deterred from providing this reading free by the old adage that "Heaven helps those who help themselves." We are sure he will remember what he reads longer if he has to give up a dollar for it now and then. We commonly do not value highly what we get for nothing. We are therefore going to forego the honor of having this journal on file in New York. If the denizens of that benighted burg cannot spend a dollar annually for two dollars worth of botany, let them read the "large number of scientific publications" that other and more generous editors are sending the library free. One of our subscribers who went into one of New York's largest book stores recently and asked for a copy of *The American Botanist,* was informed by the young lady clerk that "we don't have no call for them nature study things." We begin to suspect that New York is too much engrossed with stocks and politics to get much real enjoyment out of life.

BOOKS AND WRITERS

The Ohio State University has recently published a catalog of "Ohio Vascular Plants" by Prof. John H. Schaffner which shows that there are more than two thousand different species in the State. Of this number, about one-fourth are regarded as exotics. The catalog is a numbered list of plants with their Latin and Brittonesque names and the distribution and abundance of each species given. The nomenclature is that of the second edition of the "Illustrated Flora" and therefore follows the "American Code." In this list the classes, sub-classes, orders, families and sub-families are included in their proper places, making it easier for the user of the list to keep the run of plant relationships. This is one of the first lists to place the water lilies among the Monocotyledons. They now appear between the pond weeds and the eel-grass families. Previous to this catalog, four lists had been issued by Kellerman. The new list is therefore likely to be pretty complete and is sure to be of much value to botanical students.

Messrs. Doubleday, Page & Co., have begun the publication of a "Thresholds of Science" series designed for those wholly unfamiliar with this department of knowledge. The first volume in the series is entitled "Botany" by E. Brucker and is apparently a translation of a work originally issued in France. It would probably be a difficult task for anyone to condense a guide to all phases of botany into one book of less than two hundred pages, and the author has contented himself with an account of plant structure and physiology followed by an outline of the classification of flowering plants as laid down by Bentham and Hooker. Since most people who take up botany as a pastime are chiefly interested in the names and relationships of plants, this choice of subject matter is probably a wise one. It avoids, however, all mention of plant breeding and ecology, two subjects much in the foreground at present.

There are upwards of two hundred illustrations, mostly of plant parts which should aid the beginner in his study of relationships. The volumes in "The Thresholds of Science" series sell for 50 cents each.

When the author of "The Natural History of the Farm" was a boy, he was lucky if he had other books than "Wood's Natural History" as a guide to the wild life about him. Now there are a multitude of guides to every phase of nature and yet the reviewer doubts whether any or all of them would be as useful or entertaining to the boy on the farm or the city child turned back to nature as this new natural history. Prof. Needham, the author, appears to have touched upon all the features of outdoor life with which the child in the country is likely to come in contact. The book is really a volume on nature study, but the whole subject has been treated so sympathetically and the academic part so skillfully concealed that the reader is not likely to connect the idea of study with it. Any boy or girl who has to be urged to read the book through must be lacking somewhere. It ought to be a positive delight to fill up those outlines at the end of the chapters. Older readers are likely to remark, "If I had only had a book like that when I was young." One cannot adequately describe the charm of such a book; it must be seen and read to be properly appreciated. There are about fifty chapters and more than a hundred illustrations but this means nothing; it is what is in the chapters that counts. "The Natural History of the Farm" is published by the Comstock Publishing Co., Ithica, N. Y., at $1.50.

Gardening in America.—At least the phase of it that has to do with the cultivation of flowering plants in the open—is a long way behind the practice in England. It is therefore not surprising that the bulk of the gardening books still comes from across the water. One of the newer books of this nature is the "Hardy Flower Book" by E. H. Jenkins which is devoted entirely to the growing of the hardy herbaceous perennials. It consists of eleven chapters devoted to cultural directions and a discussion of the flowers suitable to special situations followed by an alphabetical list of the more desirable plants, covering some seventy pages. In this second part the individual species are described and their more desirable characteristics indicated. Lists of flowers for special purposes are also given. There are fifty illustrations and a colored frontispiece. Books of this kind are very useful for consulting in connection with gardening operations in this country, but it should be remembered that the climate of America and England is somewhat different and the directions given can not be too literally followed here. The book is for sale by Charles Scribner's Sons, New York, at $1.00.

PHENOLOGICAL OBSERVATIONS WANTED.—F. L. Mulford, of the Bureau of Plant Industry, Department of Agruculture, desires observations on the leafing, flowering and fruiting of all our native plants and will be glad to send record blanks to anyone who will fill them out. The information called for includes the dates at which the flowers open, and on which the last flowers fall, when the fruits begin to color, when they are fully ripe, etc. Information is also wanted as regards soils, frost, color of the flowers, etc. Compilations of such data from a number of widely distributed observers will be of value to students of many phases of botany and there should be a hearty response to the call for aid.

Vol. 20. No. 4 Whole Number 103

THE AMERICAN BOTANIST

NOVEMBER, 1914

Smithsonian Institution
JAN 5 1915
National Museum

25 Cents a Copy; $1.00 a Year

WILLARD N. CLUTE & CO.
JOLIET, ILLINOIS

The American Botanist

A Quarterly Journal of Economic & Ecological Botany

WILLARD N. CLUTE, EDITOR

SUBSCRIPTIONS.—The subscription price of this magazine is $1.00 a year or $1.50 for two years, payable strictly in advance. Personal checks on small or distant banks must contain ten cents for collection fees. The magazine is issued on the 20th of February, May, August and November.

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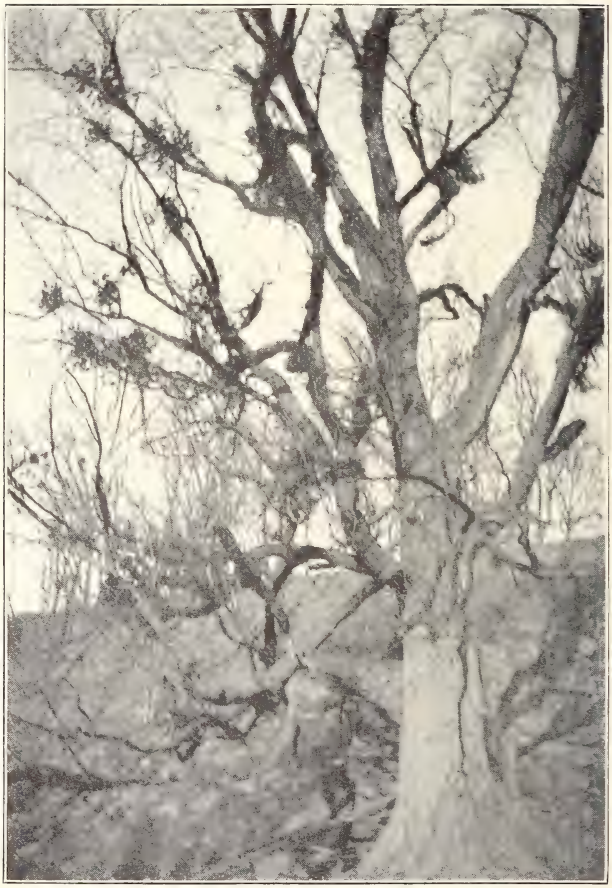


More or less globular balls of green among the leafless branches.

THE AMERICAN BOTANIST

VOL. XX JOLIET, ILL., NOVEMBER, 1914 No. 4

Excellent herbs had our fathers of old,
Excellent herbs to ease their pain,
Alexanders and marigold
Eyebright, orris and elecampane,
Basil, rocket, valerian, rue
(almost singing themselves they run),
Vervain, dittany, call-me-to-you,
Cowslip, melilot, rose-of-the-sun.
Anything green that grew out of the mould
Was an excellent herb to our fathers of old.
—Kipling.

THE MISTLETOE

By Willard N. Clute.

THE traveler from a more northern region, who happens to journey into our Southern States after autumn winds have stripped the leaves from the trees, is likely to observe shortly after he has crossed the Ohio River or passed through the region in our country in the same general latitude, that there is still more or less green in the treetops. At first glance it appears as if, here and there, groups of twigs had failed to conform to the general condition of leaflessness and were still sporting their summer verdure, but a second survey, convinces him, especially if he be botanically inclined, that he is getting a view of that famous plant, the mistletoe.

To most dwellers in the South, the mistletoe is no rarity, but to less accustomed eyes, these more or less globular balls of green among the leafless branches are likely to be of more interest. Though we no longer hold the mistletoe in superstitious reverence as a protector from witches, ghosts and demons, and have perhaps cause to doubt its efficacy in certain amusements of the winter holidays, we may still find its curious manner of growth sufficient warrant for more than a passing interest in it.

The common mistletoe, whether European or American, is really a shrub, but it always grows as a parasite on some other woody plant. In Europe it has been found on the walnut, poplar, linden, elm, locust, willow, ash, thorn, pear, apple, mountain ash, oak and almond, as well as upon various species of conifers, and in one instance, at least, it has been found parasitic upon another plant of its own kind. Our native plant is nearly as catholic in its selection of hosts. Both species are fond of trees with soft, sappy bark and thrive best on such specimens. The seeds are covered with a soft and exceedingly sticky pulp which causes them to adhere to the feet and bills of birds that feed upon them and this substance also serves to attach them to the branches of other trees in the proper position for growth. The cotyledons contain chlorophyll and it is said that the seed will not develop unless it is exposed to the light, an apparent provision of nature to ensure that growth shall not commence until the seed is advantageously situated.

When the mistletoe begins to grow it sends a suckerlike root, called a "sinker", into the soft tissues where wood and bark meet in the body of its host and takes therefrom part of its nourishment. The fact that its leaves are green shows that it is not wholly dependent upon its host for food, but the green is of a yellowish and sickly hue and of itself proclaims the plant to be a parasite. Since the trees parasitized by the mistletoe annually add new layers of wood and bark to the trunk, in the ordinary course of events the parasite would soon be covered by the increasing bulk of the tree. The mistletoe, however, is too adroit to be so easily overcome and just as the encroaching wood threatens to bury it, side roots are sent out which penetrate the bark lengthwise of the stem and these send out new "sinkers." This process is repeated annually during the life of the plant.

The beliefs which were once associated with the mistletoe originated long before the dawn of history. The plant held a prominent place in the Druid rites and was gathered for their winter festivals by a white robed priest who cut it with a golden knife. It was received in a white cloth; to let it touch the ground being counted disastrous. When the priest had given it to the people it was hung up over doors and in other places about the house to keep off evil. From its connection with such heathen rites, its use was long forbidden by the Church. In Norse mythology, the blind Hodur is fabled to have killed that darling of the gods, Baldur, with a spear tipped with mistletoe, it having been decreed at his birth that nothing that grew on the earth should harm him. The other gods combined to bring Baldur to life and the mistletoe was ordered never to work harm again, to which it agreed, provided it was not allowed to touch the earth. Thus we still hang sprays of the plant high at Christmas time as an emblem of peace and good will.

Our mistletoe is one of some four hundred species of the Loranthaceae most of which are found in the warmer parts of the world. The flowers of our plant are small and insignificant, but several tropical species are more fortunate in this respect, having brightly colored blossoms which are often six inches or more across. The European mistletoe is known to science as *Viscum album,* while the American plant is *Phorodendrom flavescens.* All the beliefs and customs which are connected with the mistletoe by right belong to the European species only, but our plant is so like the overseas species that only the scientist would notice the difference. Its use at Christmas time, therefore, may go unchallenged, partly because the scientist usually does not extend his investigations to such untechnical matters as holiday merrymaking, and partly because of the old proverb that "When one has a mind to do a thing, any excuse will answer."

THE FRINGED GENTIAN

By W. W. Bailey.

THE fringed gentian lays claim to the loveliest days of the whole year. June, which promises so much, which is replete with sunlight and blossom, may indeed vie with October. In certain moods one may prefer that time of riotous growth, and the "rare" days of Sir Launfal. The gentian days are melancholy, the saddest of the year—

"When summer gathers up her robes of glory,
And like a dream of beauty glides away."

Yet to those who love them, these days are unequalled. Full of poetic suggestion, they reinvite one to Tennyson's Idylls and the knightly court of Arthur. On such days, one traces in the early morning, the river and streams by the light mist that hangs over them. I remember once seeing the Franconia valley filled with the mist till it seemed a new and un-named lake. Through this medium familiar objects become glorified. It is the time of Nature's siesta. The air is golden and not a breeze stirs the lingering forest leaves. These now wear their warmest colors, their browns, siennas and purples, in the long run more satisfying than the more gorgeous tints of the earlier season.

There finally comes a morning when one says "The gentian is blooming today." This is expressed with the confidence, that to the surprise of some, led Thoreau to say "The *Cypripedium* tomorrow." There is nothing remarkable about it. One simply is *en rapport* with Nature. Certain signs in the air, in himself, in the general environment, lead to these intuitions. We cannot always explain them any more than the savage can explain the way in which he guides one through the forest. Given a certain sort of day and the gentian follows as a matter of course. In the spring one can as certainly forecast the arethusa and the painted cup.

We seek the gentian in some lonely meadow or beside some roadway, bordered by stone walls and shrubbery. The shy blossoms may be half hidden amidst the umbered tufts of *Osmunda*. We exclaim with Miranda—

> "The fringed curtains of thine eyes withdraw."

Few flowers have so human and expressive a presence. One feels that the meeting is sympathetic and mutual, just as he does in spring when surprising the earliest hepatica.

There are those who think that this species and the box gentian (*G. Andrewsii*) never open. Surely they could never have seen *crinita* in the mid-day sunlight of October. As a matter of fact, both the closed and the fringed gentians open, or can be persuaded to open. Bees penetrate the azure box of *Andrewsii,* while sunlight uncurls the fringes of its still lovelier cousin. Herein a mistake is often made in gathering it. When taken home, it should be put, not on the center table withdrawn from windows, but in the full southern sunlight. The lashes then unclose and the lobes expand—things of exquisite beauty.

Bryant has done for our plant what Wordsworth did for the daffodil, Lowell for the birch, or Burns for the daisy. It seems as if not a word could be added to or withdrawn from his description. The poem is as perfect and finished as the flower itself. Even in its habit and time of blooming it is sharply diagnosed. It should be said, however, that the gentian really blooms much earlier than October in many places. I remember once in Conway, Massachusetts, I found it on Field's hill on the first of September. It is the lingering blossom that the poet celebrates and the woodsman loves—those reluctant ones that still abide in mid-autumn;

"Till frosts and shortening days portend
The aged year is near his end;
Then doth its sweet and quiet eye
Look through its fringes to the sky."

It is an error to call this flower blue. Indeed, I am still looking for a really blue flower. Those that are called so are almost universally violet, for instance the chickory or *Salvia patens*. I find painting the real test of color. Often the supposed tint is wholly non-existent, but apparent from reflections of light or sympathies of one hue for another. One never suspects till he tries it, how much the pinch of white on the column of the cardinal has to do with the gorgeousness of that flower; this, and the adjacent gray. I am not an artist, however, and must not trespass on the preserves of my betters.

Plants, it is well known, have their social relations, their friendships and antipathies. Often they are intimate and tender with each other. Every wood lover has knowledge of these associations; as, say, of the golden ragwort with the painted cup. The fringed gentian in these later days affiliates with Parnassus grass, certain crimson polygalas, and an abiding group of knotweeds. With these, too, in swampy spots may still be found the glowing disks of the bur marigold.

A COMMON WILD FLOWER AND ITS LEGENDS

By Maud Going.

THE flowers renowned in song and story are generally the common things willing to live in anybody's garden, or to take care of themselves in uncultivated ground. Some of them are downright weeds, which, for untold generations, have dogged the footsteps of man, and, being often in his sight, have found place in his thoughts also. Few plants, for instance, have been more celebrated in folk lore than the red-berried elder which may be seen on any rocky hillside in the more northern United States or in eastern Canada.

Even before its leaves unfold we can recognize this elder by its big, round, purple foliage buds. They get through the winter with what seems the scant protection of four, or at most, six purple scales, as smooth within as without. The red-berried elder provides no downy coverings such as protect the buds of many northern shrubs. Its baby leaves have, so to say, neither furs nor flannels.

In May the purple scales separate and free a quartette of compound leaves and a pear-shaped cluster of small greenish blossoms. The scent of these flowers is not altogether pleasing to human nostrils, but it is enticing to flies. These little visitors are almost necessary to the forming of the fruit. The five small stamens stick out five different ways, like the rays of a star, so that it is scarcely possible for pollen to reach the pistil without the help of winged insects. But with their aid, plenty of fruit forms.

After the flies have feasted, the elder spreads a second table for the birds. In late June the berries, turned scarlet, catch the eye and pleases the fancy of birds, which are so eager for the fruit that they can scarcely wait for it to get entirely ripe.

Red-berried elder is widely distributed over the northern world, and many tales are told of it in many lands. In Denmark it is thought that the bush is protected by a powerful being called the "Elder-mother", and without her leave it is not safe to pluck the flowers. This Elder-mother is the "Huldah" of German and Norse mythology. She is the harvest goddess of Northern Europe and the queen of the elves. All the wind and cloud changes which affect the crops, but which do

A pear-shaped cluster of small greenish blossoms.

not rise to the dignity of storms, are, so it was once believed, arranged by her. In Grimm's Fairy Tales she appears as the Frau Holle who sends the snow and is so old she knows almost as much as Father Time himself.

Sometimes, so it used to be said, she would come forth as twilight fell, in the form of a little, bent old woman. Woodcutters used to see her in dim forest paths, with milk pails on her arms. Sometimes she would come to help the tired reapers, belated at their work, and she could cut the grain and bind it into sheaves with astonishing quickness. In her goddess form, Huldah is one of the lovliest figures in all heathen mythology. She is robed in white, has luxuriant golden hair, and wears a long, glistening veil. From her golden girdle hangs a key which can unlock all the treasures of the earth.

The little elves, too, were supposed to take a special interest in the elder. Hard by its roots one might find an entrance to their underground dwelling, and it used to be said that if anyone would stand by an elder bush at twelve o'clock on Midsummer night, he might see the King of the Elves go by with all his retinue.

When Northern Europe was Christianized the heathen gods and everything connected with them were condemned by the priests. This bush, once so dear to Huldah and her elves, then acquired a bad character. It was said that the elder used to be a tree, till Judas hanged himself on it, but that it has been accursed and stunted ever since. "The tree of eldre," says a famous old book, "that Judas henge himself upon, for despayre," and in a famous old poem, "The Vision of Piers Plowman," we find this allusion to the legend:

"Judas he japed (deceived)
For Jewen silver
And sithen (afterwards) on an eller
Hanged himself."

This legend of Judas caused the elder to become associated in song and story with thoughts of grief and death. Thus in

Edmund Spenser's "Astrophel", which is a lament for Sir Philip Sidney, we read:

> "Never again let lass put girlond on
> Instead of girlond wear sad cypress now
> And bitter elder, broken from the bough."

PITCHER PLANTS

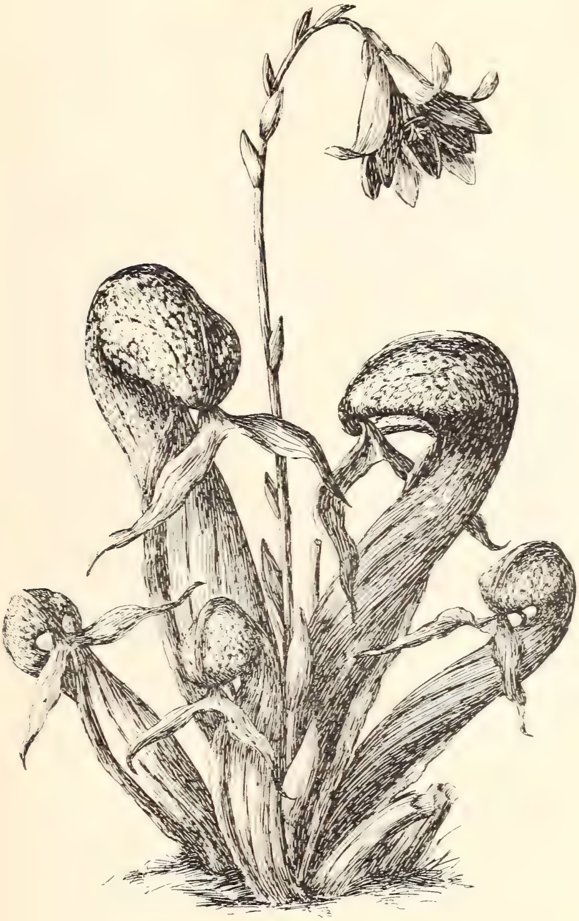
By Mrs. G. T. Drennan.

IT is difficult to see why the Sarracenias, which were named for Dr. Sarrasin of Quebec, should be commonly called side saddle flowers. Pitcher plant, huntsman's cup and trumpet leaf, are descriptive names well merited from the construction of the leaves. These are all radical from a perennial root, yellowish or purplish green in color and form pitchers or elongated cups of trumpet shape. The unique and beautiful flowers are nodding, and borne on naked scapes ten inches or more high. The calyx has five sepals with three colored persistent bractlets at the base. The corolla has five fiddle-shaped petals, arching over the greenish yellow styles and the stamens are numerous.

Sarracenia purpurea is the hardiest of the pitcher plants. It grows in mossy bogs from Labrador and the Rocky Mountains to the Gulf of Mexico. The curious pitcher-shaped leaves, six to ten inches long, dilated upward, are constructed with a usual broad wing on one side and a hairy hood at the summit.

Sarracenia flava, known as the yellow trumpet leaf, is native to the Southern States. It has narrow, winged and hooded leaves, veined with yellow, and a yellow blossom.

The California Pitcher Plant or *Darlingtonia* is the handsomest and at the same time the most curiously constructed of our pitcher plants. The hollow twisted leaf is from ten to



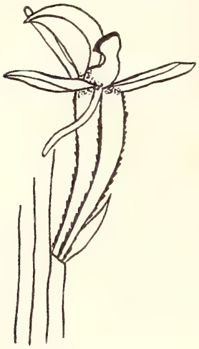
The California Pitcher Plant.

fourteen inches long, with a broad wing on one side, and a bent hood to which is attached a narrow, two-winged or forked leaf three to six inches long. The flower scape six inches above the hooded leaves bears a very handsome nodding flower with the winged purple petals and yellow anthers fully displayed. The leaves are nearly always filled with water and dead insects, which scientists have decided the plant has the power of consuming for nourishment. Thoreau says the odor of the beautiful and unusual flowers suggests that of sandal wood.

AN ABNORMAL TWAYBLADE

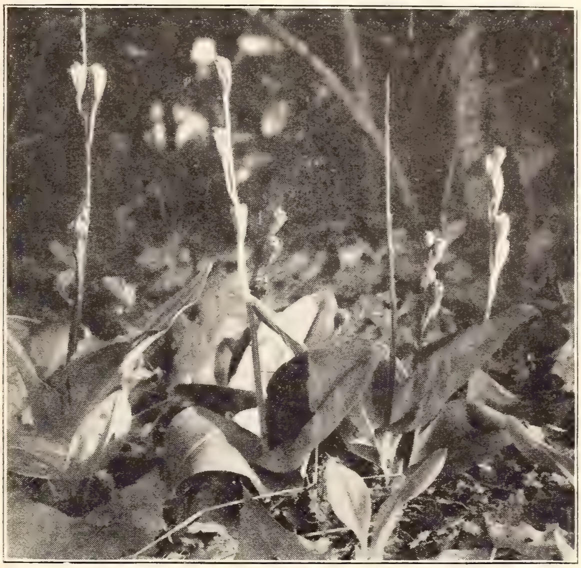
By Edwin D. Hull.

A PLANT of the twayblade (*Liparis loeselii*) grown indoors and in bloom April 22, 1914, produced an abnormal flower as shown in the accompanying figure. The parts of the flower are as usual but the interest lies in the fact that there is no twist to the ovary and hence the flower is not inverted as is the case with the vast majority of orchids. This flower was the basal one. None of the other four flowers on the plant had opened by April 29 when it was put into formalin.



The inversion of the orchid flower is supposed, by some at least, to be for the convenience of insects as the lip in this position affords an excellent alighting place. If this is true, then the lack of inversion might be said to be due to the fact that since this species is self-pollinated and hence has no need for insect visitors, the flowers are commencing to have a tendency to remain uninverted. The lack of inversion did not prevent pollination and the ovary was rapidly maturing when preserved. Such reasoning, however, sounds like teleology which at present is in disrepute.

The lack of inversion was no doubt due to hard conditions as the plant was not protected by glass from the gaseous, steam-heated air hence there was not sufficient vigor imparted to the flower to enable it to twist. The remaining flowers did not have strength to open at all. The inflorescence was exceedingly dwarfed being much surpassed by the leaves, while the reverse is ordinarily true in nature or in specimens under glass in cultivation.



That the plants are self-pollinated, I have proved to my satisfaction as they fruit readily indoors under glass where there is no possible chance for them to be visited by insects. Neither in nature have I ever seen insects about the flowers. The pollen masses are found attached to the stigmatic surface when the flower opens so that as far as the welfare of the species is concerned the flowers might just as well be cleistogamous and remain closed.

[That the twayblade, whether self-pollinated or not, bears seeds abundantly in the open is shown by the photograph of a colony of these plants in an Indiana woodland. The photograph was sent by Albert C. Williams.—Ed.]

SWEET FLAG AND CALLA

By Adella Prescott.

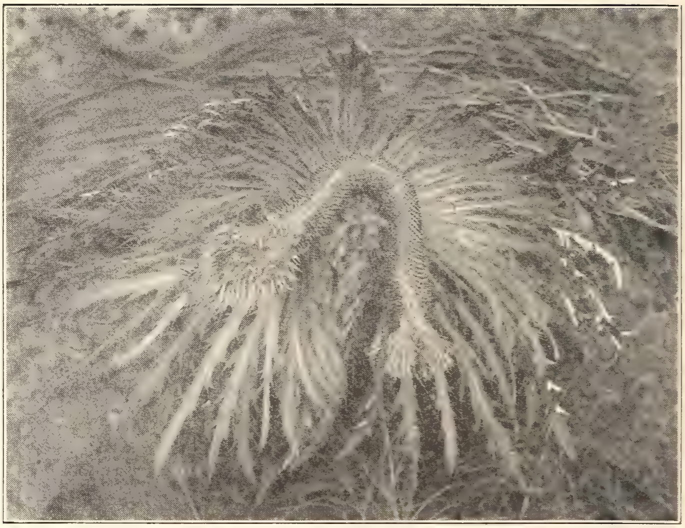
ONE of the things that is a constant surprise to the amateur botanist, is the relationships that exist between plants that are very unlike in general appearance, some members of a family being elegant and aristocratic in habit and flower, while others, like poor relations, have a full share of the family virtues under a modest and inconspicuous guise.

Something of this surprise I felt when I discovered that the humble sweet flag (*Acorus calamus*) was a near relative not only of our native calla, but of the exotic calla or "lily of the Nile" as well. It is a very common plant growing in swamps and along the margins of sluggish streams from Nova Scotia to Florida and far westward. It has a thick creeping rootstock that is pungent and aromatic and which, being boiled in syrup and then dried, was a favorite confection of other days.

The foliage consists of swordlike leaves and the cylindrical spadix emerging from a scape very much like the leaves is so inconspicuous that when as a child I discovered it and also discovered that it was good to eat, I found very few of my companions who had ever seen it, and we had no suspicion that it was the flower of the plant. This spadix or fleshy axis is densely covered with small perfect flowers which are light greenish-yellow and very inconspicuous.

Everyone knows the elegant calla of the florist, but as it is an exotic anyway and too suggestive of funerals to be a suitable subject for so slight a sketch, I will only mention it in passing and write of our native calla (*Calla palustris*) which is perhaps quite as beautiful though much more modest in habit and size. This charming plant is found in cold bogs, often clinging to a half-submerged log where it holds its flowerlike spathe a little above the smooth heartshaped leaves while the fleshy roots are hidden in the slime and ooze. The beautiful spathe is white and of the same rich texture as the greenhouse calla, but, unlike that, is flat and open while the real flowers are greenish yellow, very tiny, and closely packed about the oblong spadix. The plant cannot be called rare, but, owing to its un-hygienic liking for wet feet, is naturally absent over wide stretches of territory.

Both of these plats are members of the Arum family—a very large family, but one whose members are chiefly tropical. Of other northern members, one is the skunk's cabbage (our very earliest wildflower, but one that most of us willingly miss) and Jack-in-the pulpit who contrives, better than some other clergymen, to combine the modesty of the commoner with the elegance of the aristocrat.



A TERATOLOGICAL THISTLE

By Aven Nelson and J. Francis MacBride.

FASCIATION in plants, causing more or less pronounced monstrosities in vegetative, floral or fruit characters is not rare. The writers have never seen, however, a more pronounced or interesting example than the one shown in the accompanying illustration. It is that of a specimen of Thistle (*Carduus Drummondii*).

The fasciated stem was large, notably flattened and fistulous. The several stems, that evidently had entered into its makeup, had succeeded in combining their several heads with equal completeness and more striking results. Lying within the compact, truncate, ample, lunate-oblong fasciation of floral leaves was the compounded head. In general aspect it strikingly simulated a large slightly coiled spinose-hispid caterpillar some four or five inches long and about an inch in diameter. If one poked the inflorescence one fairly expected to see it squirm.

University of Wyoming, Laramie, Wyo.

FOOD PLANTS FROM THE WILD

IN the matter of domesticating plants, let us glance hastily at what has and what can be done in our country. In DeCandolle's treatise we make but a poor showing, indeed. Out of his 247 cultivated species, but 45 are accredited to the New World and but three of these—the pumpkin, Jerusalem artichoke and persimmon—come from North America. To these three, Sturtevant added about thirty. The poor showing of our continent in furnishing food plants, it must be made plain is not due to original inferiority. The number would have been vastly greater, as Asa Gray long ago pointed out, had civilization begun in this, rather than in the Old World.

Wild fruits abound in North America. The continent is a natural orchard. More than 200 species of tree, bush, vine, and small fruits were commonly used by the aborigines for food, not counting nuts, those occasionally used, and numerous rarities. In its plums, grapes, raspberries, blackberries, dewberries, cranberries and gooseberries, North America has already given the world a great variety of new fruits. There are now under cultivation, 11 American species of plums, of which there are 433 pure bred and 155 hybrid varieties; 15 species of American grapes with 404 pure and 790 hybrid varieties; 4 species of raspberries with 280 varieties; 6 species of blackberries with 86 varieties; 5 species of dewberries with 23 varieties; 2 species of cranberries with 60 varieties, and 2 gooseberries with 35 varieties. Here are 45 species of American fruits with 2,226 varieties domesticated within approximately half a century. DeCandolle named none of them.

The fruit of the wild plum (*Prunus maritima*) and inhabitant of sea beaches and dunes from New Brunswick to the Carolinas, is a common article of trade in the region in which it grows, but notwithstanding the fact that it readily breaks into innumerable forms and is a most promising subject under hybridization, practically nothing has been done towards domesticating it. Few plants grow under such varied conditions as our wild grapes. Not all have been brought under subjugation though nearly all have horticultural possibilities. It is certain that some grape can be grown in every agricultural region in the United States. The blueberry and huckleberry, finest of fruits, and now the most valuable wild American fruits, the crops bringing several million dollars annually, are not yet domesticated. Coville has demonstrated that the blueberry can be cultivated. Some time we should have numerous varieties of the several blueberries and huckleberries to enrich pine plains, mountain tracts, swamps and waste lands that otherwise are all but worthless. There are many varieties of Juneberries widely distributed in the United States and Canada from which several varieties are now cultivated. The elderberry is represented by a dozen or more cultivated varieties, one of which, brought to my attention the past season, produced a half hundred enormous clusters, a single cluster being made up of 2,208 berries, each a third of an inch in diameter.

These are but a few of our fruits—others which can only be named are: the anonas and their kin in Florida, the native thornapples and crabapples, the wineberry, the buffalo berry, several wild cherries, the cloudberry, prized in Labrador, the crowberry of cold and Arctic America, the high bush cranberry, native mulberries, opuntias and other cacti of the deserts, the pawpaw and persimmon and the well known and much used salal and salmon berries of the West and North.

The groundnut (*Apios tuberosa*) furnished food for the French at Port Royal in 1613 and the Pilgrims at Plymouth in 1620 and as a crop for forests might again be used. There are a score or more species of *Physalis* or ground cherries native to North America several of which are promising vegetables and have been more or less used by pioneers. *Solanum nigrum* the nightshade, a cosmopolite of America and Europe, recently much advertised under several misleading names, and its congener, *Solanum triflorum*, both really wild tomatoes, are worthy of cultivation and in fact are readily yielding to improvement. In China and Japan the corms or tubers of a species of *Sagittaria* are commonly sold for food. There are several American species one of which, at least, was used wherever found by the Indians and under the name of arrowhead, swan potato and swamp potato, have given welcome sustenance to pioneers. Our native lotus, a species of *Nelumbo*, was much prized by the aborigines, seeds, roots and stalks being eaten. *Sagittaria* and *Nelumbo* furnish starting points for valuable food plants for countless acres of water-covered marshes when the need to utilize these now waste places becomes pressing.—*From an article by U. P. Hedrick in Science.*

GATHERING GALAX FOR MARKET

DURING the past decade a new plant for winter decorations has appeared in our markets. This the galax (*Galax aphlla*) a plant whose round bronzy-green leaves are valued for many uses by the florist. The following account of the way these leaves are collected is taken from *The Southern Field.*

The gathering and marketing of the leaves of galax has become an industry of considerable importance in the mountains of Western North Carolina. The properties of the leaf which cause it to be singularly adapted to florist's uses are its pleasing heart shape, beautiful color, deep green or bronze and its durability. Exposed to the action of wind and sun galax leaves retain their beauty for eight or ten days.

The leaves are gathered only during the fall, winter and early spring. During the late spring and summer the leaves are soft and succulent, hence perishable. For the rest of the year they are tough, having a leathery feeling. The collecting season is from October 1 to March 15.

During the fall and early winter the leaves are deep green in color, later, due to the action of frost and sun, the color changes to a deep bronze. The bronze leaves are the more highly prized. Green leaves are available throughout the season as leaves which are densely shaded do not change in color.

The work of gathering the leaves is largely left to the women and children. It is a common sight to see several women and perhaps a dozen children starting early in the morning for the galax beds.

The leaves are pulled, not cut. Where the entire petiole is not taken it has been found that the leaves wilt in a few days. As the leaves are pulled they are put loose into large cloth sacks. Crushing them down and filling the sacks very full does not hurt the leaves. Each night the leaves are carried home. A good puller will gather ten to twelve thousand leaves per day.

To be marketable the leaves must be assorted as to size and color and neatly tied into bunches of twenty-seven leaves each. Forty of these bunches count as one thousand leaves. The reason twenty-seven leaves are put into each bunch is to allow for culling. Only perfect leaves are salable. Should there be any damaged leaves in a bunch they are pulled out by the merchant who buys them. Two leaves can be taken from each bunch and still forty bunches will make the one thousand leaves.

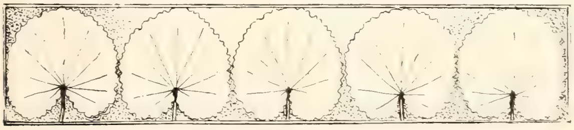
The leaves are green or bronze, and the smaller ones are from two and one-half to three inches across, while the medium are three to four inches and the large ones are more than four inches.

The sorting and tying is done on stormy days and at night. All fair weather is spent pulling the leaves. It requires nearly as long to sort and tie up one thousand leaves as it does to gather them.

For the leaves delivered at the store the pickers receive in trade 25 cents per thousand. The cash price is two cents per thousand less.

As the leaves are brought to the storekeeper they are packed in standard wooden cases of ten thousand leaves each. Each case contains but one size and color of leaves. To protect the leaves against drying out in transit the cases are lined with oiled paper and in the top and bottom of each is placed dampened moss.

The galax industry has a very beneficial effect along the line of preventing forest fires in the localities where the leaves are gathered. Where fire runs through a bed no leaves can be gathered for several years. Thus, the people who pull the galax are very careful with fire and are always ready to aid in the extinguishing of fire that threatens their collecting grounds. It has been some twelve years since there has been a serious forest fire in the South Toe River Valley in Yancey county, North Carolina, due very largely to the fact that many hundred cases of galax are gathered there each year.



THE SEDGES

THE sedges (*Family Cyperaceae*), are grasslike plants but easily distinguished from the true grasses by the following characteristics: The culms are solid, pithy, cylindrical, trigonous or flattened (Grass culms by contrast are mostly hollow, and cylindrical). The sheaths are not open lengthwise opposite the leaf blade and tightly enclose the culm. The spikes are simple or compound, and mostly subtended by leaflike bracts which are sometimes longer than the culm. The spikelets are one to many flowered, each flower subtended and sometimes embraced by a single short, herbaceous or scarious bract or scale, the most characteristic mark of the family. The fruit is an achene, trigonous, lenticular or plano-convex. In the genus *Carex* only, it is enclosed in an herbaceous sac called the perigynium.

Like grasses they grow in all kinds of soil from the wettest to the driest, in the densest shade and on the open prairie, from the tropics to the limits of vegetation in latitude and altitude. Many are especially hardy and flourish in the latitudes where grasses are few and start in the spring when pastures are still bare affording short feed for stock at a time when it is most needed. On the average they are not as valuable for hay and pasturage as the grasses, which is plainly shown by the fact that man has never found one that seemed worthy of cultivation, while the grasses constitute the most valuable family of plants for the use of man in civilization.

Nevertheless the sedges form, in a stock raising state like Nebraska, a not unimportant part of both hay and pasturage and are eaten greedily not only from necessity at times but also for the very desirable variety that is thus added to the rations of our stock. In some swales and marshes where hay can be cut in the drier years, they outbulk the grasses ten to one, and the hay passes unquestioned in the market with no detriment to either horses or cattle.

After studying the sedges for twenty-five years, I can say that while they are undoubtedly as difficult as any of the flowering plants there are none that give greater pleasure to the earnest student of systematic botany, for it is the difficult things in life that call out our resources and develop our powers. Yet I observe that few college or university students have shown an interest in them, and fear it is because the sedges bear a bad reputation. I imagine also that this is partly because the collector finds that he can do little with them in bloom beyond settling the genus, and he does not always have the opportunity to follow up the same set of plants into fruiting time and so complete his work.

As I wish to increase the number of sedge students, especially among high school teachers, I venture to insert some practical suggestions that will facilitate the work. Collect only when in fairly mature fruit, one or two months after blooming. If over-ripe, save achenes in packets labelled exactly as is the plant. If scales are dropping, include them in good quantity with the achenes. Use Gray's seventh edition Manual because it has the most scientific and practical keys that have so far been given to American students. It is a delight to use them. Proceed slowly; exercise great patience with your own success for a time. If you get a name from one whom you trust, go through all the steps as if you knew nothing about the name and prove him right or wrong as the case may be.—*J. M. Bates in "Sedges of Nebraska."*

NOTE *and* COMMENT

White Horsemint.—Several years ago, one rather wet summer, while doing field work in botany, the writer came upon a big bunch of the wild purple horsemint (*Monarda fistulosa*) which was snow white. The leaves were just a shade lighter green than other bunches growing about, but the blossoms were white as snow with not a hint of color showing either in bud or full grown blooms. The flowers were examined daily until all buds had bloomed and died without showing color. The white mint did not appear the following year and the question still remains, what did it?—*Mrs. James Edwin Morris, Arthur, Illinois.* [This is undoubtedly a case of albinism of which many exist in both plants and animals. It is due to a lack of some factor which causes pigmentation. It is rarely found in flowers whose colors depend upon definite colored corpuscles in the cells but is not uncommon in those colored by cell sap. Albino flowers seldom if ever revert to the normal colored form, and usually their seeds produce albinos like themselves.—Ed.]

Puffballs for Nosebleed.—Mrs. J. D. Tuttle, Marlboro, N. H., notes that the "smoke" from the puffball is useful in stopping bleeding from the nose, being simply puffed into the nose. The "smoke" of course, consists of myriads of puffball spores and in all probability stops the flow of blood much as other powdered substances might do. A physician to whom the cure was mentioned said it was harmless, at least, but this latter statement may be open to doubt. It is surmised that certain eye troubles may be caused by spores of the puffball getting into the eye. Thus the belief of the children that the "smoke" from puffballs will make one blind may have some basis in fact. If puffball spores will stop the flow of blood, however, the fact is worth noting. We regret that certain war-like Europeans were not thoroughly fumigated with puffball smoke early last summer.

ABUNDANT MUSHROOM SPORES.—It is reported that a vigorous specimen of the field mushroom can produce ten thousand million spores. This number is so vast that it can scarcely be appreciated, but the behavior of another species that recently came under our observation helps to give an idea of the immense number of spores produced. A student brought in two specimens of the oyster mushroom (*Pleurotus ostreatus*) growing on a water-soaked piece of wood. Neither specimen was more than four inches across, but shortly after being placed in a specimen case they began to shed spores and in a short time had covered three shelves each three feet long and a foot wide, with a coat of spores. Printed papers, lying on the shelves, were so deeply covered that the print was invisible. The precariousness of the mushroom's hold on existence, however, may be realized when the abundance of its spores is contrasted with the number of plants that manage to grow. The conditions for getting started are so rigorous that probably not one spore in hundreds of millions produces a plant that survives to maturity. The flowering plants with, at best, a few dozens or hundreds of seeds, have arrived at a much better solution of the problem of survival.

CERCIDOPHYLLUM LEAVES.—The ordinary bud is essentially an undeveloped stem with its appendages. In spring, this bud throws off its bud-scales, if it has any, the embryo stem lengthens and the leaves appear in their places. Then, in most of our plants, the stem rests whether cold weather has come or not. New bud scales are formed about the tender tip, within the protection of these scales a new set of embryo leaves develop and soon a new bud is ready to endure the winter and continue the stem another year. While this new bud is forming, other new buds appear in the axils of the old leaves and the following year produce side shoots or twigs with their accompanying leaves. As is well known, when one set of leaves fall another set is never produced in their places. A twig has leaves upon it only during the season in which it is formed. According to Apgar's "Ornamental Shrubs of the United States," however, a Japanese tree, *Cercidophyllum Japonicum*, produces new leaves annually in place of the old leaves until the twigs have reached a diameter of an inch or more. There seems to be some mistake, here, however. Leaves always arise from buds and we query whether it is not possible that the appearance of a single leaf may be explained as arising from an auxillary bud and thus only apparently arising from the old leaf scar.

DISTRIBUTION OF CACTI.—It is the general impression that all members of the cactus family are natives of America, but C. K. Dodge, of Port Huron, Michigan, questions this opinion. The eleventh edition of the "Encyclopedia Britannica" intimates that there are some species in tropical Madagascar and the "Encyclopedia Americana" says that there is one species in Ceylon which was known to the ancient Greeks and Romans. The word cactus is found in the language of both these peoples. Other cyclopedias mention cacti as natives of the Old World and the "Illustrated Flora" of Britton and Brown speaks of the group as nearly all native of America. On the other hand Wood's "Class Book of Botany" says all the species are American and so does Kerner and Oliver's "Natural History of Plants." Ellsworth Huntington, who has for some time been making a study of desert conditions in both Hemispheres, says that there are no cacti in the Old World. The

"Columbian Cyclopedia" says "the cacti are without exception, natives of America." In the face of such contradictory opinions from what we are used to consider authorities, we hesitate to decide. That there are cacti growing without cultivation in various parts of the Old World is not questioned, but whether these are native species or merely American species that have become naturalized is the question. On the other side of the world certain other species, notably the spurges, take on the appearance of cacti, but such forms would scarcely be mistaken for cacti by scientific men. If any of our readers can settle this question we would be glad if they would furnish the names of such foreign species and data as to the country they inhabit.

Ultra-Violet Flowers.—The rays of visible light, as everybody knows, forms but a small fraction of the number with which the physicist is familiar. The human eye perceives only those rays which produce the color sensations which we know as red, orange, yellow, green, blue, indigo and violet, but man has made a sort of artificial eye—the photographic plate—which has a much wider range and can perceive rays beyond the red end of the spectrum as well as others beyond the violet end. As may be supposed, there is a great difference in the appearance of objects photographed first by ordinary light and then by ultra-violet light. If objects absorb the ultra-violet rays, they come out dark on the photographic plate, while if they have the power to reflect the rays, they come out nearly white. Two Costa Rican experimenters have been examining a great many different flowers in ultra-violet light with the result that they have found about a dozen which reflect so much of this light that they propose to name them ultra-violet flowers. All corollas thus far found which have the power of reflecting the ultra-violet rays are yellow, and among them are the dandelion, pumpkin, cucumber, sow thistle and evening primrose. The investigators whose notes appear in the *Scien-*

tific American are inclined to think that the reflection of ultra-violet light has the same purpose as the reflection of visible light, that is, the attraction of insects. It is well known that ants can see in ultra-violet light and it is quite likely that other insects have the same ability. While there is no difference that the eye can note between flowers that reflect and those that absorb ultra-violet light, the experimenters found that when an ultra-violet flower is placed in a beam of ultra-violet light, the reflected rays when allowed to strike a sheet of white paper moistened with acid quinine sulphate caused the alkaloid to become highly luminous while other flowers make no impression upon it. In this connection it may be well to call attention to a note in this magazine for November, 1913, in which a number of flowers are mentioned which, to the eye, are clear yellow, but which come out in two colors in a photograph. Possibly the areas of different color may reflect the ultra-violet light in different proportions.

FORMATION OF STARCH BY PLANTS.—In elementary botanical courses we are usually told that the plant forms starch in the leaves by the union of carbon dioxide and water in the presence of sunlight, but it appears that this process is not quite so simple as this explanation might lead one to think. According to a writer in *Science*, this is what really happens: "During the formation of starch through the agency of chloroplast or leucoplast we conceive that there is instituted a predetermined, orderly independent and interdependent series of reactions the first of which is manifested in an interaction between water and carbon dioxide through the agency of an enzyme in the formation of an oxidase to form formaldehyde. During this process there is formed another enzyme which tentatively may be designated as an aldehydase that reacts with the formaldehyde and by polymerization and condensation of six molecules gives rise to a simple sugar such as dextrose. At the same time, another enzyme appears in the form of maltase which, reacting with the dextrose, causes the formation of maltose during which reaction another enzyme, a dextrinase is produced which reacts with the maltose to yield dextrin. Going on with this reaction another enzyme which may be designated as amylase appears which reacting with the dextrin forms soluble starch. During this stage, there arises another enzyme a coagulase which converts the starch from the soluble to the insoluble form of ordinary starch." It is fortunate for the young plants that they do not have to understand all this before they can begin making starch for themselves.

TASTE OF POISON IVY.—Mrs. J. D. Tuttle, having inadverted tested poison ivy (*Rhus toxicodendron*), reports that it has a flavor resembling that of black cherry. In cases of poisoning from this plant, she recommends a tea made from cleavers (*Galium*) to be used internally and as a wash. Most mild cases of ivy poisoning will run their course in a few days and leave no ill effects but in the case of a few susceptible individuals a physician may even have to be consulted.

CONTINUOUS FLORAL SHOOTS.—That the flower is essentially a transformed branch is frequently asserted by botanists, and the flowers often prove it by producing leaves instead of petals or carpels or even by originating a new bud in the center of the flower which may in its turn produce a new flower cluster. In an Australian group of shrubs, known as bottle brushes (*Callistemon*), a variation of this phase is found. Here the flower spike is terminal, but eventually the tip resumes growth and becomes a leafy branch which may later produce another crop of flowers at its tip, and this may be repeated several times, forming a single branch beset with leaves, flowers and fruits in successive zones.

THE USEFUL BURDOCK.—Up to the present, few uses have been found for the homely burdock except that of teaching patience and perseverance to the agriculturist. The roots of the plant still have some repute as an ingredient in medicines intended to improve the blood but a more rational course of living is rapidly making such invigorators unnecessary. A new use of the fruit of this plant, however has recently come to our attention. The burs, glued to the back of small pasteboard emblems or advertisements serve admirably to attach them to the clothing. At country fairs, on tag days, in political campaigns, etc., the omnipresent button may soon be replaced by this new sort of a stickpin which requires only a touch to attach and when once in place will stick to anybody closer than a brother.

LINCOLN AND THE WHITE SNAKEROOT.—A trifle often changes the destiny of individuals as well as nations. The great State of Illinois takes considerable pride in the fact that Lincoln was one of her "favorite sons," though, as a matter of fact, he was born in Kentucky and did not migrate to Illinois until he was nearly grown. This move, if we may trust the historians, was largely due, though in a roundabout way, to the white snakeroot (*Eupatorium ageratoides*). Lincoln's mother Nancy Hanks Lincoln died of milk-sickness and it was her death that caused Lincoln's father to remove to Illinois. Milk-sickness is a disease of cattle often known as the "trembles" which can be communicated to human beings. Its occurrence in cattle is due to their eating our familiar woodland plant, the snakeroot. The plant is not always harmful, but like the loco-weed, in some locatities it takes from the ground certain substances that cause the disease. It would not surprise us if some enthusiast should propose the white snakeroot as the state flower of Illinois when its connection with history is better known.

TREE DOCTORING FOR INSECTS.—In country districts, one may still find tree doctors who go about from door to door offering to cure sick trees by the use of iron and sulphur. The iron is supplied by driving a handful of nails into the trunk of the tree and the sulphur added by boring a hole in the tree and putting in the sulphur in powdered form. To those who still dose themselves with sulphur and iron tonics, this treatment of the trees seems the most rational thing in the world, but the botanist scouts the idea that it can be of any use whatever. A writer in *Science,* however, advocates something similar for preventing the attacks of insects. Having specimens of Spanish broom that were badly infested with the cottony cushion scale, he bored holes in the trunks and filled them with crystals of cyanide of potassium, carefully plugging up the openings. In a very short time all the scale insects dropped from the trees, dead. Cyanide of potassium, it may be said, is one of the deadliest poisons known and the question then arose as to whether similar treatment of trees with edible fruits would render the fruits harmful. Accordingly peach and orange trees were tried without apparent ill effects. H. A. Surface, however, who is State Zoologist of Pennsylvania, reports that the good effects of this treatment are only temporary and the bad effects very permanent inasmuch as trees treated with cyanide of potassium are ultimately killed by the treatment. He cites scores of orchards that have been killed in this way. The idea of "vaccinating" trees against the insects seems to have originated in Pennsylvania, but in spite of the warnings of scientific men, the fakirs are making money in the business.

SPECIES IN THE GENUS ASTER.—For some time botanists of conservative tendencies have held the opinion that the aster genus has been split into rather small fragments. Everything that differed appreciably from named forms has had a binomial or trinomial name attached to it. In view of this situation it is refreshing to find a student of the asters confessing that there does not seem to be any hard and fast lines for delimiting species in this genus. In a paper on the asters of Wisconsin, Charles E. Monroe writes: "The old notion of a species as something definite, fixed and stable, nowhere breaks down more completely than when an attempt is made to apply it to the different forms of *Aster,* as we find them in this country. Different species are so connected by intermediate forms that we often feel like ignoring specific distinctions and grouping two or more species together under one name. On the other hand, to one of a more analytical bent of mind the differences between members of a single species may appear so marked that he will be under constant temptation to separate them into still smaller subdivisions and to give to each specific rank. But whichever course we follow, the different groups into which the genus or species may be divided represents little more than particular tendencies or directions of variation and the members of each make up a series illustrating the different stages. The word "species" applied to our North American asters can hardly be said to have any other significance than this. It does not seem a valid objection that under such a definition a single plant might be conceived as belonging to more than one species." When we contemplate the splitting of species, we are reminded of a once popular song which dwelt upon the remarkable resemblance of all classes of coons. One does not discover at first glance small differences in any group of plants —they all look alike; but a closer acquaintance multiplies the points of difference. The whole question then is, where do the differences cease to be specific. Shall we have our plants sorted out into fairly recognizable groups, or shall the divisions be as fine as they are in the violets where it is facetiously said that to name a violet one must not only know when and where it was collected, but who collected it.

STEREOCHEMISTRY.—We are often at a loss to explain the behavior of certain plants, but if the theories of those scientists interested in stereochemistry are correct some at least may be explained by the molecular structure of their parts. Only three or four chemical elements are found in the majority of plant substances. For instance, such widely differing substances as starch and sugar, vinegar and alcohol, wood and oil, mucilage and wax, are composed of carbon, hydrogen and oxygen in varying amounts. Still more remarkable, it is known that the sugars, though made of exactly the same amounts of these elements, are very different in their effects and in their reactions with other substances. These differences are now believed to be due, not to different amounts of the elements composing them, but to the different way in which these elements may be arranged in the molecule. Miescher has estimated that the serum globule molecule may exist in a thousand million forms. Of the twelve known forms of glucose, only dextro forms (that is, those which rotate a beam of polarized light to the right) are fermentable or capable of being used by certain low organisms for food. In other substances the dextro forms may be untouched and other forms used. It thus appears that the structure of the molecule is of immense importance in the reaction of the organism or its parts and this may explain why one substance is poisonous when another exactly like it in composition is not, or why a substance may poison one organism and not another closely allied to it. By this theory may be explained the reason why the pollen grains of one plant will not germinate on the stigma of a related flower and why other plants more distantly related can be crossed with it. It depends largely upon the structure of the molecules of their protoplasm. Stereochemistry opens an inviting field for speculation and its further advances will doubtless be fertile in results.

FRUITS WITH A FEVER.—Plants are so different from animals that we sometimes fail to realize that they are not only alive but that their tissues function like animal tissues at least so far as the fundamental life processes go. Plants respire, digest, assimilate, excrete, perspire and perform many other acts which are regarded as chiefly characteristic of animals. Plants may even get a fever when injured. When a potato tuber is cut, its temperature immediately begins to rise. When animals exercise they become warm and so do plants, for the liberation of energy is always accompanied by heat. In the case of ripening bananas it has been found that one calorie of heat per kilogram per hour is liberated. In this case the starch is being turned to sugar, exactly as in digestion in animals.

EUCALYPTUS VS. SEQUOIA.—The general impression seems to be that the blue gums (*Eucalyptus*) of Australia are the tallest trees in the world but that the redwoods (*Sequoia*) of California have the greatest girth. This impression, however, seems to need revision. According to a note in *Scientific American* by F. W. Goding, U. S. Consul General at Guayaquil, Equador, the tallest specimen of Eucalyptus thus far measured was 220 feet high, while Dr. Sargent records a specimen of the California big tree 340 feet in height. If these measurements are correct, the American trees are more than a hundred feet taller than the best specimens of *Eucalyptus* thus far discovered and this record leaves our own big trees with such a lead that it is probable that our claim to having not only the trees of greatest girth but also the tallest specimens in the world cannot successfully be refuted.

POISONOUS NETTLES.—In our youthful days a moral used to be drawn from the story of two boys who picked some nettles. The first individual siezed the nettles boldly and received no harm but the second grasped them with some hesitation and of course was stung. The moral that filtered into our childish intellect was "Put up a bold front or be stung," and while this was probably not exactly the lesson intended, we have since been pained to observe that it is still a favorite precept with a good many people. When it comes to nettles, however, there are some that had better not be grasped, boldly or otherwise. Certain of the tropical species are so poisonous as to be capable of killing a man if he comes in contact with any considerable number of the stinging hairs. In a case recently related by a Panama scientist, who came in contact with about ten of the stinging hairs of *Jatropha urens*, he was so nearly overcome that he remained unconscious for more than an hour. The attack produced much swelling of the arms and other parts of the body, accompanied with intense itching, the respiration was difficult and vomiting occurred. The amount of poison that caused these symptoms is estimated as five hundred thousandths of a cubic centimeter. The stinging hairs of even our native species are admirably adapted to their work and are not unlike a hypodermic syringe, the tip of the hair being silicious or glassy, with a hollow running down to a bulb below in which the poison is contained. When a careless touch knocks off the tip of the hair, a sharp hollow needle is left through which the poison is ejected into the wound. The poison is similar to that which the bee uses so successfully in defense, but is much stronger.

EDITORIAL

At the close of another volume, we take the opportunity to say a few words regarding the volume to follow. In its superficial aspects it will be much like those that have preceded it but if our subscribers and contributors do their best it will much excel any that have gone before. If they show a disposition to "let George do it" they will probably get a surfeit of articles from the editorial pen. We may add, by way of parenthesis, that the editor is a pretty busy individual who issues the magazine because he likes to see it go and therefore while it may come out irregularly it will appear in due time, which is the main consideration. An abundant supply of articles and notes would conduce to greater regularity in its appearance, however. At this time we may also point out that the magazine costs only 75 cents a year if one subscribes for two years in advance and asks to be put on our "permanent" list. Possibly half of our subscription list is of this permanent character. Those on the list regard themselves somewhat as backers of a deserving enterprise and expect to be considered as subscribers until they notify us to stop sending the magazine. Such subscribers renew annually when the spirit moves them. There is room on the list for a few more names. As the country weeklies put it "Now is the time to subscribe."

* * *

At this season when many renewals of subscription are due, we beg our friends not to send us checks on out-of-the-way banks. It often costs us 25 cents to collect a check for 75 cents and this is a reduction that we are not willing to stand. Money orders or stamps usually reach us safely and any bank will sell a draft on New York or Chicago which is absolutely safe. Checks on the banks of large cities except those of the far west are also acceptable, but a check for 75 cents on a bank in an opening in the tall timber causes us to lose interest in existence.

* * *

No matter how hard the scientist tries to disseminate accurate information, he finds some irresponsible just ahead of him with a story of plants or animals so wonderful that a public, educated via the moving picture route, much prefers it to any sober statement of fact. It is easy for the reporter on the hunt for a "human interest" story to contort the facts until they have little semblance to the truth in his efforts to entertain the public. The advertiser of a set of natural history books that are at present being introduced to the public asks in one of his circulars, "Do you know that the dew plant kills and eats every fly that alights on its petals by ensnaring with a sticky substance?" We confess that this is news to us. We have seen the sun-dew but never one that caught flies with its petals. In another place this same individual informs us that his books will tell us why an ant's head may often be seen walking by itself without a body. Since the ant's legs are attached to its thorax and not to its head we hope we may never encounter this remarkable sight. We know of several people who would never seek for the explanation of such a phenomenon in a book. It would be the Keeley Cure for theirs. Much as we value knowledge, we incline to agree with Josh Billings that "It is a good deal better to know less, than to know so much that ain't so."

BOOKS AND WRITERS

"A Textbook of Grasses" is the title of a new book by A. S. Hitchcock, Agrostologist of the United States Department of Agriculture, in which the author has endeavored to include everything of value on the subject of our wild and cultivated forage crops. One will look in vain for a systematic description of grasses in this book. Only those are mentioned which possess some degree of usefulness as food for man or stock. The book, however, is much more than a discussion of grasses as botanical species. There are chapters devoted to pastures, meadows, lawns, hay, weeds, ornamental grasses and grasses for purposes other than food. The morphology of the vegetative and floral organs is discussed in two chapters, while ecology, taxonomy and classification have chapters alloted to each. The various grass genera are systematically treated and keys to the important species given. The book is of importance for containing a large amount of matter relating to grasses that is usually missing from such books. The volume covers 260 pages with upwards of sixty illustrations. It is published by the Macmillan Company, New York, at $1.50 net.

The mechanism of the ascent of sap in stems has never received an adequate explanation. The force necessary to raise the sap to the tops of high trees is considerable, often amounting to a pressure equal to twenty atmospheres, and such plant processes as have heretofore been brought forward to account for it have had to be dismissed, one after another, as unequal to the task. In these investigations, capillarity, osmosis, evaporation, root pressure, vital activity in the cells, and many others have been tried and found wanting. An Irish botanist, however, Dr. Henry H. Dixon, of Trinity College, Dublin, seems to have solved the problem. He finds that water has a surprising cohesive power when enclosed in the ducts of plants, and the cohesion of sap is still greater, often amounting to a pressure of 200 atmospheres. In the stems of plants, then, the water and sap are in practically solid columns extending from the leaves down to the roots. When, therefore, water is abstracted from the cells of the leaves by evaporation or other processes of the plant, the pull exerted is transmitted downward to the roots and more water is taken in. A book by Dr. Dixon in which the subject is discussed at length with much experimental proof has just appeared from the press of The Macmillan Co. It is entitled "Transpiration and the Ascent of Sap in Plants." It is undoubtedly one of the most important contributions to physiological botany that has appeared for some time and seems to have cleared up a problem which has long perplexed plant students. The price of the book is $1.40 *net.*

In "Studies of Trees," J. J. Levison, who is Forester to the Department of Parks, Brooklyn, N. Y., has given us still another kind of tree book. Most of those with which we are familiar aim solely at identification. The present book goes farther and discusses the best trees for lawns, streets and woodlands and how to plant them, the important insect and fungus pests with means for their eradication, pruning and tree repair, forestry, and the uses of wood. The first half of the book is taken up with a description of our common trees under such heads as distinguishing characteristics, form, size, range, soil, enemies, commercial value, common names, and comparison with other trees. All the information given is useful, but the lack of a key to the trees themselves must render this largely a sealed book to the beginner, at least as far as identifying the trees is concerned. Those who know the trees will find much in the book of interest. There are 150 illustrations of specimen trees, examples of bark and wood and of the insect enemies of the trees. The book is issued by John Wiley and Sons, New York, and costs $1.00.

Dr. Jacadis Chunder Bose, professor in the Presidency College, Calcutta, but at present delivering a course of lectures in the United States, has written a remarkable volume on the "Irritability of Plants" in which he details his experiments in studying the phenomena of plant movements. The nature of the subject makes the difficulties of experimentation all but insurmountable, but with a great variety of ingeniously constructed apparatus of original design he compelled various "sensitive plants," foremost of which was the well known *Mimosa pudica*, to register their responses to a large number of stimuli including light and darkness, heat, electricity, mechanical shock, fatigue, chemicals, etc. The text of the book, which covers 360 octavo pages, is illustrated by nearly 200 diagrams and drawings showing the machines used and the results obtained. Although Dr. Bose worked with plants whose movements are sufficiently noticeable to entitle them to the name of "sensitive plants," he asserts that not only are all plants sensitive but all plant organs as well. Ordinary plants do not appear sensitive simply because their reactions are less conspicuous. The rhythmic movements of the plant tissues were found to be remarkably like the rhythmic movements in the tissues of animals. As one reads this book he is at a loss which to admire more, the ingenuity with which the various tests were devised or the patience and care with which they were carried out. The book cannot fail to be of much interest to all students of plant physiology. It is issued by Longmans, Green & Co., London and New York, at $2.50 net.

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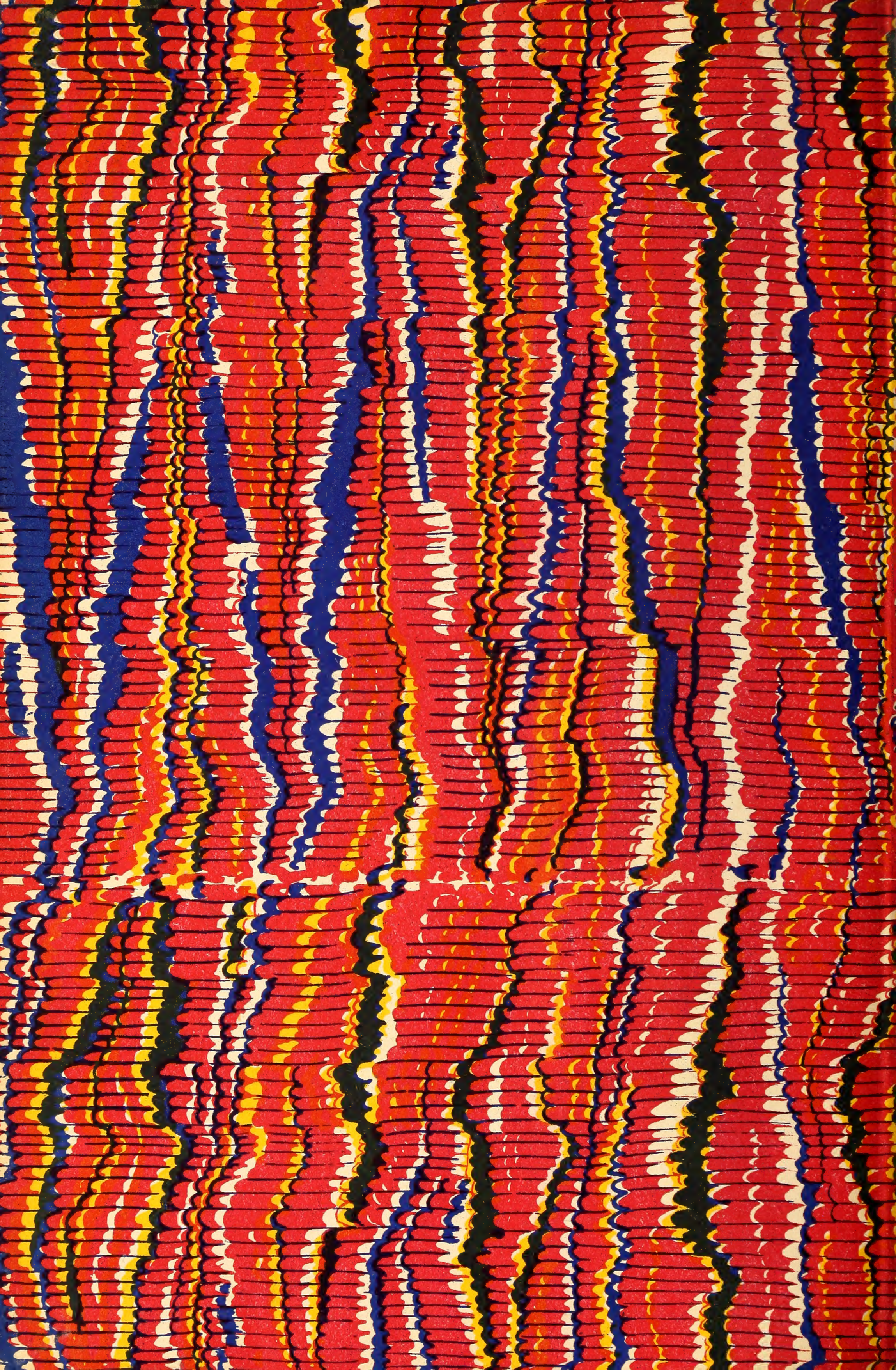

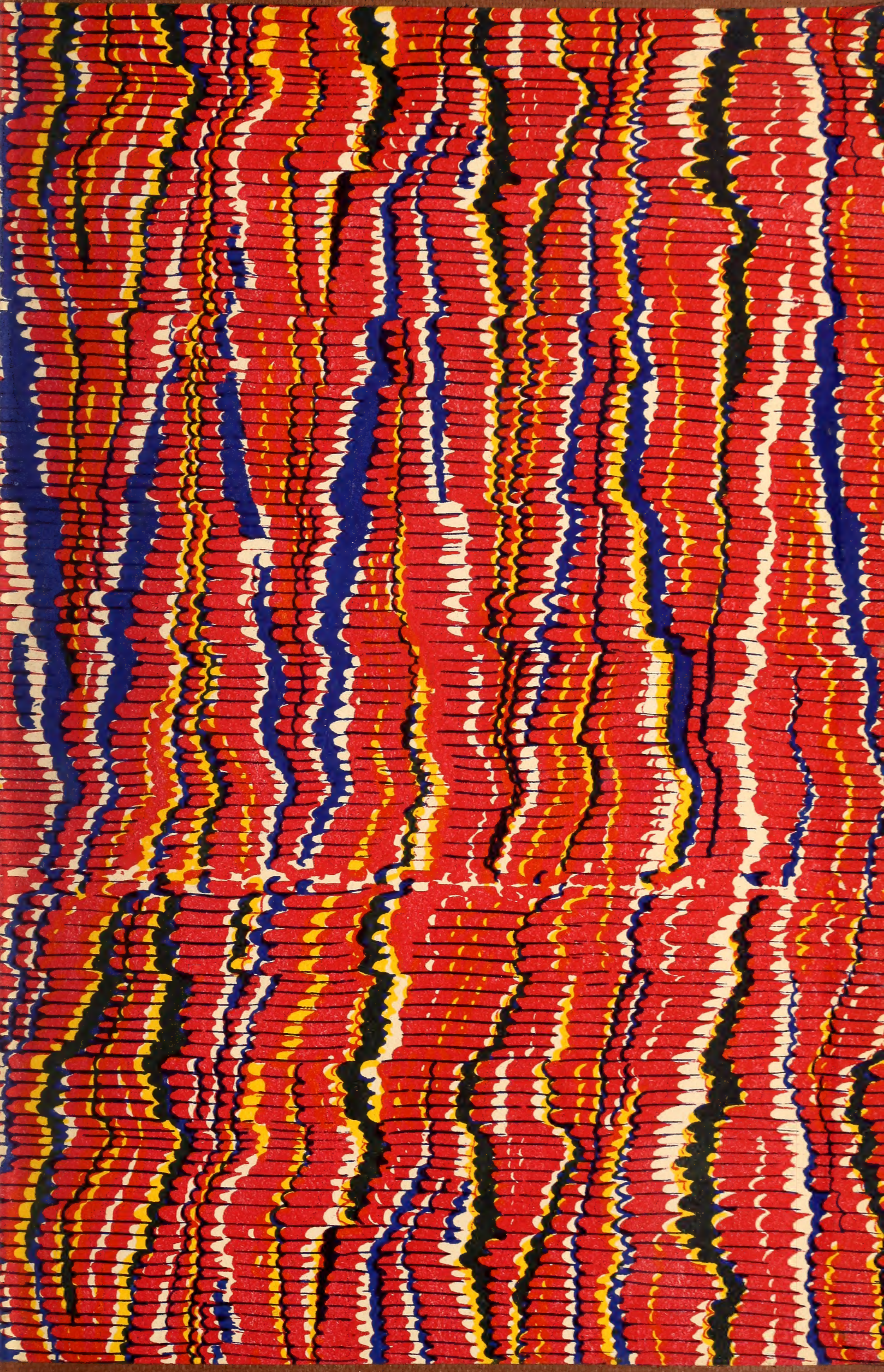

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